Solar Racer - Entrepreneurial Case Studies - Budgeting Patent Costs

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Midnight Engineering

Resources And Insight For The Entrepreneurial Engineer

January/February, 1996
Volume 7, Number 1
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For 8051, 251, and 166 Software Professionals

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Reader Service Number 105

January/February, 1996
Volume 7, Number 1

Midnight Engineering

Resources and Insight For The Entrepreneurial Engineer

About ME ...

ME is dedicated to those individuals interested in creating, developing, producing, and distributing high technology products. The content is meant to address the individual and small enterprise, their entrepreneurial issues and opportunities, and the technology they use now and will use in the near future. The magazine is designed around the concept of "a half-dozen entrepreneurial engineers sitting around having a beer." Topics will range from embedded systems technical details to software and hardware design. A particular issue might cover biotechnology or nanotechnolygy just as well as everyday personal business such as taxes or time management and productivity. Quite simply, ME reflects the exchange of experience, insight, and concerns of today's entrepreneurial engineer.

This magazine was developed, edited, produced, and published by one person — there is no editorial or production staff involved at any time. The contributors are entrepreneurial engineers and their submissions are not intended to set any literary highwater marks.

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COVER: **Sonny and Jeb formed Gold Talon,Inc. when they found themselves with a better idea for a tribrach. The tribrach sits atop the surveyor's tripod and serves as a level and mounting for surveying instruments. Their product and their story is on page 12. — *WEG***

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- One year warranty

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79214

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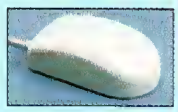

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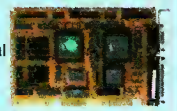

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The Mirage Ahead

William H. Gates III has a new book out called ***The Road Ahead***. If you haven't read it, I suggest that you get a copy. At $29 it is overpriced, but you will want to have this one on your bookshelf right next to your copy of ***NeXT*** and ***When Harley Was One***. The price of $29 is not so high after all, when you consider that my new book will cost the same and include a nifty CD-ROM likewise.

No sooner had Bill's book hit its best-selling stride than the politics and industry of computing and telecommunications began to change in not so subtle ways. The affect of the new telecommuncations laws will be profound and unpredictable.

In ***The Road Ahead***, Bill talks of change in the PC and communications world. He assumes, as do most people, that we have vaulted onto a new plane where the technical strides of the last decade will form the basis of a new worldwide information and communications explosion. While he does humble himself and allow for the fact that Microsoft may have trouble making all the right moves, Bill leaves the reader with the impression that at least enough right moves will be made. For all his honesty — after all it is quite refreshing to hear a billionaire talk of things outside his control for a change — he doesn't come anywhere near considering the notion that the PC and consumer related computing could even possibly be a fashionable and stylistic fad. All of us hope that there is more to this, but the hyped productivity of the PC is about to be tested. After all, the IBM PC sprung out of the early 1980s, just after a significant recession. Since the mid-1970s there has not been a "real" recession where the bulk of the people really got worried. From time to time in history most people have panic attacks related to the security of their job. After a year or so of retrenchment, they once again loosen their purse strings and poke their heads up out of the sand to see what toys they might be able to afford again. Recent economic and business news might be worth some consideration.

Apple Going Down

Apple got broadsided by a poor Christmas season and is sitting on a $billion in inventory and an ever smaller slice of the personal computer market. Some folks try to blame it on Windows 95 finally catching up with the Mac interface, but that would be to deny the inevitable fate of any egocentric company with such a small market share. Much of their market was educational institutions, but those institutions could not ignore forever the fact that the real world is predominately IBM compatible PCs. Now Apple is desperately trying to find a buyer for the company. There is nothing quite so embarrassing in high tech as to be a $billion company with no idea what to do or where to go.

AT&T Breaking Itself Up

AT&T is splitting into three parts and laying off 40,000 with $billions in write-offs. Remember that they got rid of tens of thousands of employees just a few years ago. For a major corporation to voluntarily break itself up means that CEO Allen is one of the few people who finally figured it out: ***It's not the size of the corporations, it's the structure.*** If you thought that IBM was done when it got rid of 100,000 employees in the last few years, get ready for the next round — for the companies like IBM that don't get it, the downsizing is hardly even started yet.

AT&T will become the model and Bill's first major mistake may be to not break up Microsoft in a similar fashion. I'll give him the benefit of the doubt regarding Windows 95 for now. It seems like he has fractured his Windows customers into those who made the transition from 3.1 to 95, those who bought 95 and aren't using it, and the bulk that haven't any compelling reason to even consider Win 95.

Of course, IBM could have acquiesced to reality a decade ago and split itself up. While it still has the money, IBM might want to start taking over insurance companies and put all those great IBM sales and marketing types back to work selling solutions to people's real problems (death and taxes) instead of trying to get people to buy appliance computers.

Whoa, just today I hear that DEC is getting out of the PC business. Could it be that Apple and DEC are starting to see what I have been looking at for ten years: the whole personal computer business has yet to prove itself through a major recession. It's been an amazing run and I have enjoyed it as much as anyone else. PCs have been fun and have made some of our lives more interesting, but the fact is that the PC is a product of the odd economic expansion of the last 15 years. There has been so many deficit-driven, discretionary dollars floating around that PC-based solutions have been more popular than productive. There is so much product in the pipeline now, that any serious reces-

continued on page 75

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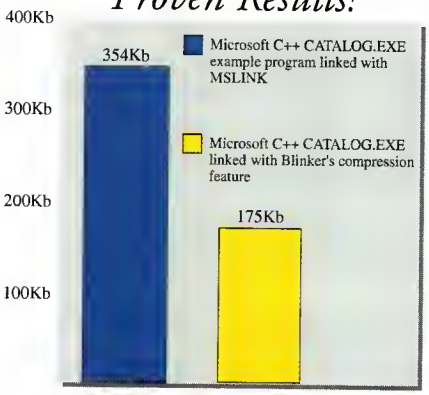

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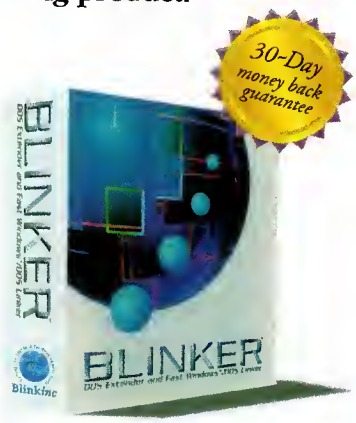

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Reader Service Number 33

Letters To ME

ENTCON 1996 Keynote Speaker

Bill, I am looking forward to seeing you at ENTCON 1996. I'm in the process of preparing my speech...remember our deal? Per your request, I have agreed to be the keynote speaker at ENTCON 1996; you promised you would publish your e-mail address and set up a web site... I'm waiting...

A lot has happened since I last wrote to you. This year is shaping up to be an exciting one so far. One event in particular (which took place today, January 26, 1996) will significantly alter the future of Doctor Design, and I believe it will impact the engineering services industry as well. Doctor Design is merging with a Santa Clara-based embedded software company called Integrated Systems. In connection with this transaction, Integrated Systems (which trades on the NASDAQ, [INTS]) will issue common stock and options worth approximately $17.5 million in exchange for all DDI outstanding stock and options.

This merger is actually a pooling of interests and resources. DDI will continue to operate in a "business as usual" manner as a whole subsidiary of our larger counterpart. I am excited about future business prospects and opportunities for our joint venture. Integrated Systems' large sales force of fifty and our talented engineers here at DDI should prove to be a powerful combination. Out future technological developments now have the financial backing to power forward, and with ISI's internationally located sales team, we will jump from being a private San Diego company to an international enterprise. Our customers are endorsing our decision as they see the potential benefits this merger could bring to their company's future dealings with DDI. See you in March.

Marco Thompson
Doctor Design
San Diego, CA

[Congratulations on the merger, you deserve the rewards. I hope you will relate some of the ups and downs of DDI on the way to this success. I will publish my e-mail address in the March/April issue and the web page should be ready by spring.—WEG]

Snappy

I too have the "Snappy" video-to-computer gadget, reviewed in Winter/95 issue. I second Mr. Tipton's enthusiasm, but with some reservations: it's not so good in the videotape color mode. That is, you must remember it does its magic by repeated "exposures," and it can't do that with your videotape. I had trouble getting color off the video tape — "washed-out" — which was made somewhat better with one of those video fixit gadgets ($100 @ Radio Shack, cheaper elsewhere). Considering that Snappy's about $200 and plugs into the printer port — i.e. you can use it on laptops — it's probably a good deal even if it only did black & white.

I use WordPerfect 5.1 — I consider it that last working word processor; it runs in DOS (i.e. cheap) and doesn't crash too often (i.e. as opposed to Windows, Word/WordPerfect for Windows, etc.). Any others who use this product might want to purchase "TrueType for WordPerfect" (Laser Tools). I got it @ $50 or so in a CompUSA (in the Windows software section), and of course it lets you use TrueType Windows fonts — which you can get virtually for nothing these days; a bunch come with it — in WordPerfect with a number of printers, including LaserJet II, IV (there's a list on the box). Seems to work fine. (It was crashing, apparently because I had my VGA screen configured for 50 lines. Don't do that. Instead, configuring the screen inside WordPerfect for 50 lines seems to work fine. And, weirdly, they actually had living technical support on the phone.)

J.G. Owen
South Huntington, NY

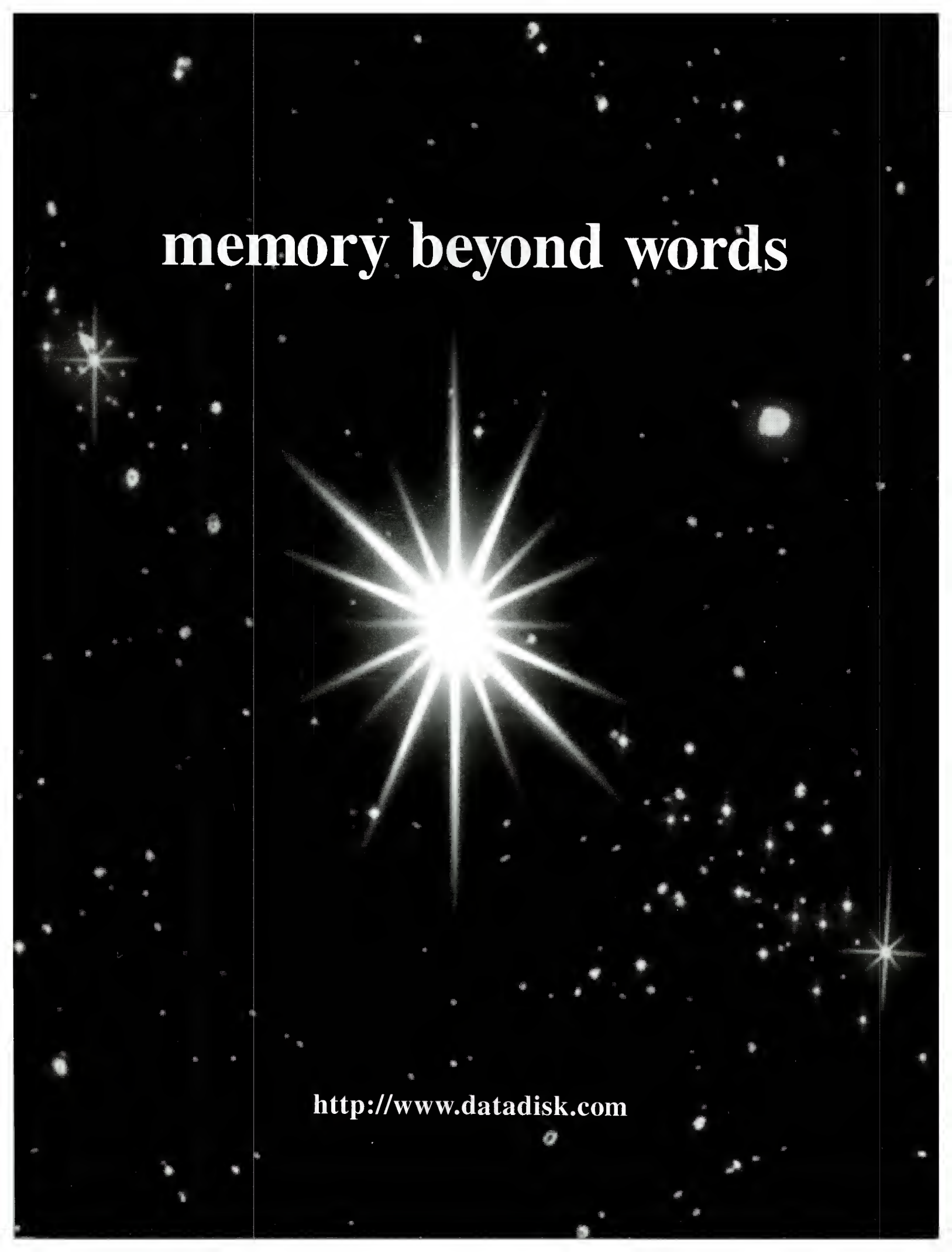
[Ron Tipton will be back in the March/April issue with his review of the color capabilities/limitations of Snappy.—WEG]

Won't Renew

No Thanks to the recent renewal notice. No more ME for me. Maybe no one has said this before, but in my opinion, ME has gone downhill since you started RFPC. The overall quality is poor, and I'd rather direct my scarce dollars to pubs that want to look good to their valued reader as well as present useful info. In addition, I find your stance against e-mail a bit "shrill" and that too was a factor in not renewing. That you aren't "with it" enough to recognize the value of e-mail and web pages, then that makes me wonder about...? E-mail and web pages are no universal panacea, but they are genuinely useful tools that I'd guess the majority of your readers make productive use of regularly.

S. S.
Woodinville, WA

[Thank you for your previous subscription to Midnight Engineering. You may resubscribe at any time. Meanwhile, don't waste your time or mine with more nonsense about how "with it" you or anyone else is or isn't. That is leftover teenage peer pressure nonsense that I never subscribed to then and I don't now. There is nothing more trivial and unproductive than emotional jabbering about some would-be or could-be benefits that would be really "neat" when and if the speed and content ever arrive. It reminds me of the juvenile arguments of certain programming language enthusiasts. Most web pages are less interesting than the Yellow Pages and far less efficient. When this whole thing shakes out, most of the rhetoric will end up being just about as worthwhile as fins on a 1960 Cadillac. If it works for you use it, but don't try to tell me or anyone else that you made a logical decision not to subscribe to a magazine based on the editor's opinion — you simply are overreacting. I have said that there is value in e-mail and the WWW, but that I don't find either very compelling. I have also said that many people will make wrong decisions during this emotional mess.If you read ME you would know about my one-year test (see Marco's letter above)—WEG]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Simply a Better Design

Jeb Filkins, Sonny Porter, and Tim Hixon

by William E. Gates

Sonny Porter and Jeb Filkins are sitting across the table from me in a conference room at my friend Tim Hixon's surveying equipment and supply firm in Fort Collins, CO. Tim, a surveyor and inventor in his own right, has introduced me to these two guys who have made an end-run around the big boys. Their patent pending invention is what surveyors call a tribrach. The device sits atop a surveyor's tripod and serves as a leveler and mounting for the various instruments of the the trade. Their new company name is Gold Talon, Inc.

The truck test would obliterate their competitors' units.

The story is a classic. Sonny has some 16 years experience as a surveyor. Jeb is a machinist — or was a machinist until he was laid him off along with several hundred other Denver area machinists when the aerospace/military industrial complex started downsizing and consolidating. Kind of hard to find work in your profession when there are 10x too many guys looking for the same job. Jeb bought his own CNC milling equipment and started his own machine shop — he said he wanted a place to play. Jeb and Sonny both credit their playing around as helping them in their design ideas and keeping realistic about the business.

Sonny and Jeb had been friends for some time. When their fortunes were at a lower ebb, they built houses together. They couldn't get loan approval to buy themselves houses, so they found lower cost land and just built the houses themselves. Eventually, they found themselves looking for something to do as a product in order to eat.

They wanted to create "Specialty Equipment for Professional Surveyors." They had seen newer technology applied to products in other fields, but surveying equipment wasn't seeing it. Sonny knew from his work and listening to other surveying professionals, that much of the newer equipment still had the same old irritating problems. It seemed like the manufacturers just didn't hear their customers.

For example, Jeb noted that the Burri scope, widely used on hunting rifles, was constantly being improved. But, the scopes used in surveying had not seen improvement in years.

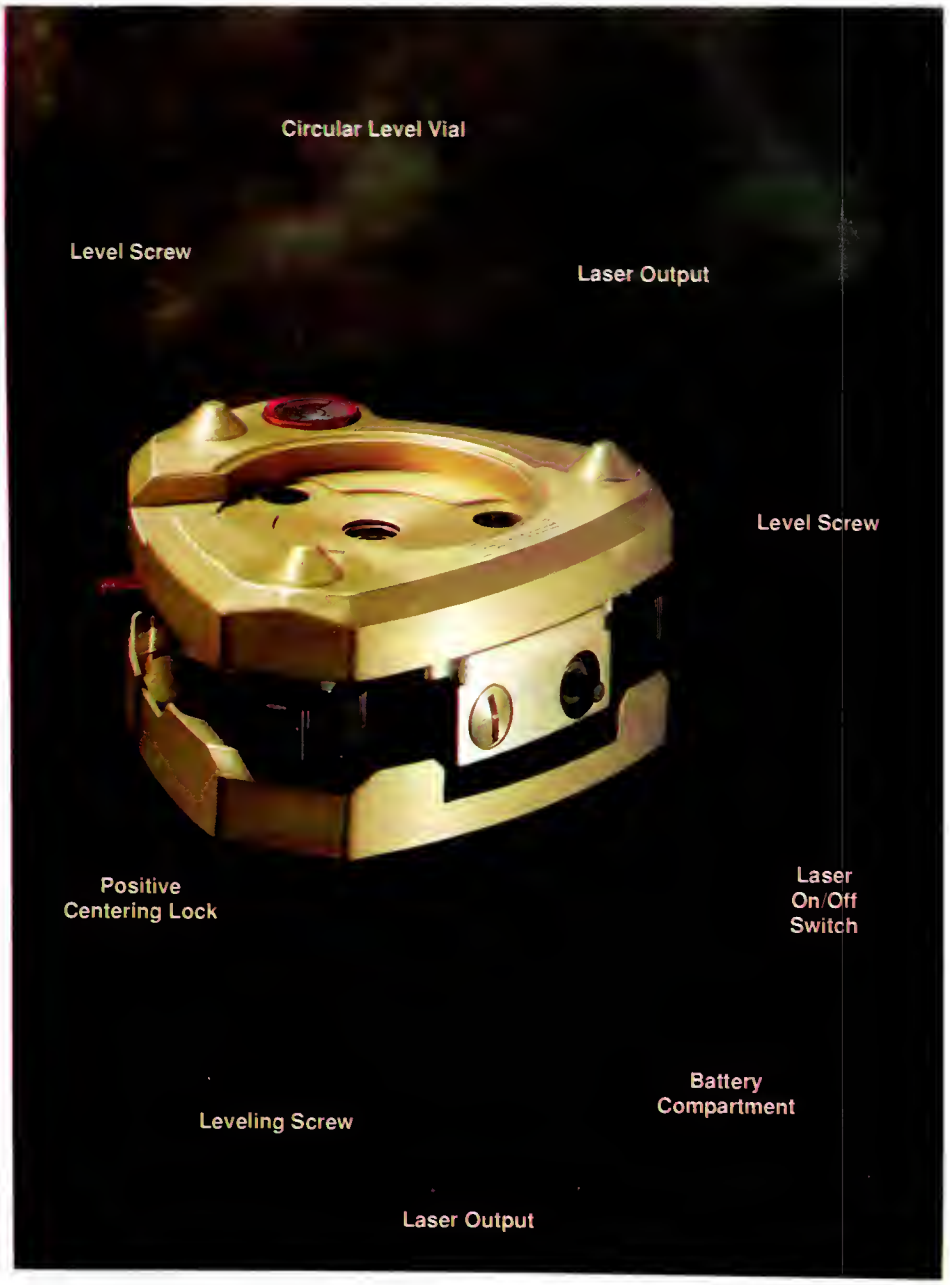
Hixon Manufacturing

Sonny and Jeb settled on the tribrach for their first product. The unit sits atop the surveyor's tripod and serves as a level and mount for the "total station" — the state-of-the-art electronic surveying instrument Sonny complained about the existing tribrachs: "they are made of cast *pot metal*, they don't center easily, they don't lock down well, and they just aren't durable enough for the surveyor's field work."

Jeb listened and put his machinists talents to work. Rather than cast the body of each unit, Jeb machined it from 6061T6 heat treated aluminum. They came up with a positive locking and automatic centering mechanism. Sonny knew all the field-related problems, so they kept integrating new elements into the design to correct or eliminate the field problems.

For example, instead of industry typical 12 - 18 pound load capacity, the Gold Talon tribrach handles 12 - 1800 lbs. The Gold Talon tribrach has been drop tested from a five story building and run over by a truck. The unit survives such tests and remains an accurate and useable instrument component.

Sonny doesn't have a Ph.D. in anything, much less laser technology. But, that didn't stop him from doing his own research, testing, and implementation in the product. The ruby laser is visable in broad daylight and can be shot upwards



for use in the darkness of mine surverying.

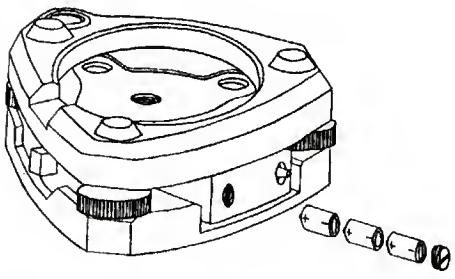
I asked about their manufacturing plans. They want to do all their manufacturing in the USA and do it themselves. In fact, they plan on bootstrapping the operation by hand building each product until orders reach a certain level. They know just how long it takes to make the products and exactly how much order flow is needed to go to their next level of manufacturing.

According to Jeb, they need to produce and sell 30/month in order to pay for his machinist expense. At 50/month, they pay for their partnership (which pleases the spouses). Producing and selling 130 units per month (which they can do themselves) would make their enterprise a real success in their eyes.

Sonny and Jeb talked about the desire to keep their enterprise in the fun zone. They don't want to have to grow up and get too serious about this business, because they may have other ideas that they know will come along and be worth playing with.

We talked about how things keep changing. For years, surveying and other industries have been gone to the Japanese. But, with that has come a certain aloofness of these producers toward their market and the end user.

Sonny just got tired of the same old problem with the tribrachs and, with some good old American ingenuity, there is now a new American force in the surveying equipment market.



The Gold Talon Tribrach's laser is powered by three "N" size alkaline batteries.

Jeb admits to being trapped like everyone else, from time to time, thinking that everything has already been done. Or, that surely an idea so obvious would be in the works at all the suppliers already. But, when Sonny and Jeb talked with those suppliers about these ideas, they were told that it had already been tried and could not be made to work. Of course, these folks were quite startled when Sonny informed them that Gold Talon had, in fact, made it work. Jeb said, "It's a good thing we didn't know it couldn't be done before we did it!" Beyond the laser technology, there are unique design elements like automatic instrument centering and a locking mechanism that can't accidently unlock (a typical field problem). The automatic centering is a real productivity booster, since the user need not re-center an instrument each time the tripod is moved in the course of surveying or instrument changes.

Gold Talon is being located in an old building in Pine Bluffs, WY. Like a lot of old buildings, there is an apartment upstairs — so Sonny moved right in. They bought the building for a song and the Pine Bluffs community (pop. 1,500) is thrilled that they are coming to town. Like a lot of rural areas, Laramie County has programs to help foster just this type of business. At a recent special meeting of the County Commisioners, Jeb and Sonny were awarded a $120,000 loan-grant package for their startup and early expansion costs.

The Gold Talon tribrach retails for $595 which is at the top of the field for tribrachs. But the Gold Talon tribrach has a built-in adpator to allow accessories to be mounted without the cost (additional $100) and complexity of the typical tribrach accessory adaptor.

According to Tim Hixon, "When you add up all the unique features of their new design, it will be very appealing to many field surveyors. We've got 26 Gold Talon tribrachs on order." Tim points to the stability and durability as the major advantages of the product. "A better built car doesn't mean everyone will go out and buy one," he said. "But those who appreciate the stability and quality will buy one." The unit can absorb vibration, typical of construction sites, without altering its accuracy.

Sonny and Jeb lost no time in creating derivative products from their initial implementation. They even created a reduced function version without the laser (based on a request from one customer) and added it to the product line as a low end model.

WEG

Sonny Porter and Jeb Filkins can be reached at Gold Talon, Inc. POB 2075, Cheyenne, WY 82003, 307-638-1503.

Competitive Comparison

Features	Gold Talon Model #GT250	Chicago Steel Tape #61-3500	Topcon Model #55501	Geometer Model #571905560	Sokkia Model #7311-35
Laser Accuracy and Repeatablity	YES	NO	NO	NO	NO
Positive Locking Mechanism with Handles	YES	NO	NO	NO	NO
Large Lead Crystal 10/2mm Bubble Vial	YES	NO	NO	NO	NO
Constructed of AG Impact Resistant Materials	YES	NO	NO	NO	NO
Temperatur/Elevation Tolerant	YES	NO	NO	NO	NO
Operational In All Lighting Conditions	YES	NO	NO	NO	NO
Built-in Tribrach Adaptor	YES	NO	NO	NO	NO
Free Carrying Case	YES	NO	NO	NO	NO
Free Limited Lifetime Warranty	YES	NO	NO	NO	NO
100% Made In The USA	YES	NO	NO	NO	NO
M.S.R.P.	$595.00	$379.00	$462.00	$595.00	$490.00

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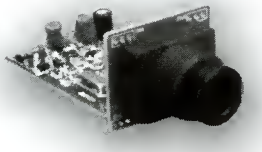

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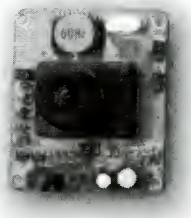
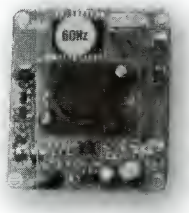
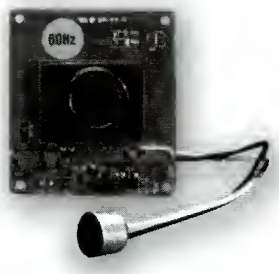


PC-18XS, medium wide angle lens.

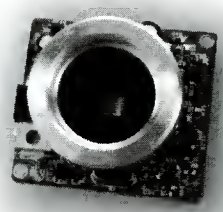


PC-18XP, with covert pinhole lens.

PC-18XSA, with audio.



PC-18XPA, with audio.



PC-18XC, with C/CS lens mount.

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Virtual "squishiness" event cues, Avatars with unique "feel" properties, User-definable tactile response signatures, Libraries of addressable "feel event" tactile texture models, Universal force reflecting interface devices, Objects that become "hard" or "soft," or "resist" when touched in cyberspace . . . .

Most people tend to think of current day virtual reality computer systems as having some sort of 3D display device that is worn or can be peered into, and a motion tracking device/manipulator to interact with the objects in the displayed 3D "world." But what if you could "feel" the contents of that world you are interacting with, and perhaps more interestingly, what if multiple participants in the same virtual world experience could "feel" each other?

An example of an interactive tactile response VR "glove," being developed by Ron Renzi and his research team at Sandia National Laboratory, Livermore CA. Tactile "texture events" can be rendered to the user as a data stream, via an electromagnetic driven set of rods, or pin grid array, which provides a topographical feature set representing the textural "content" of a virtual object.

by Charles Ostman

This is one of those curious moments in time where a seemingly unrelated combination of different technologies come together to provide yet another "rung" on the ladder of VR development. Having personally worked with so-called "engineered materials" development many years ago, and in particular, investigation into shape changing alloys and their applications, it is worthy to note how the long and winding road of "techno-symbiosis" can lead to new, and unexpected places.

Out from an obscure realm of solid state physics often referred to as "dual shape memory effect," or DSME, particularly as it applies to collection of homogenous metallic alloys, most notably a nickel-titanium alloy often referred to as NiTiNOL (Nickel Titanium Naval Ordnance Laboratory, where it was first discovered), comes what may become the next step in bi-directional tactile response virtual reality interface devices.

One of the early pioneers in exploring the potential of DSME alloys, and specifically NiTiNOL, is Dr. David Johnson. He now has his own company (TiNi Alloy, San Leandro CA), and can most often be found in his laboratory along with a small but dedicated cadre of technical support staff. I personally had the good fortune of working with him as a research technician in the early 1970s at Lawrence Berkeley Lab. Back in those days, DOE (Department of Energy) funded a myriad of alternative energy related projects, including inves-

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You Can Touch It

neurosurgeons who wanted to "experience" the feel of puncturing a human skull with a probe and subsequently targeting a region of neural tissue on a sensory model, before performing such an operation on a real human.

Incidentally, the creation and retrieval of such "feel events," as an addressable library of tactile event signatures, is exactly the paradigm that would be used in eventually establishing a tactile event stream protocol that could be linked into a VRML 3D "page" or world that could be transmitted through the internet.

The PHANToM is a finger insertion device, somewhat like a thimble. It is described by its developer as a "universal force reflection interface." The system actually contains three DC motors which directly control the forces exerted upon the X, Y, or Z axis. Position of the thimble, which is attached to a manipulator arm, is determined by optical encoders, which in turn provide feedback information to the system. Depending upon the particular details of the virtual "feel" properties of the item being "handled," the motors will exert force, and transmit torque against the manipulator arm, and the person's finger inserted into the attached thimble.

An entire glove constructed in a similar fashion is already in development. At Sandia National Laboratory, Albuquerque, NM, there has been considerable effort spent in investigating the potential applications of force and feel-dependant interface applications, including virtual surgery events. However, Sandia Lab has also been investigating other devices for interactive "feel event" simulations as well.

Ron Renzi, who heads a group there specifically devoted to this realm of development, has also been experimenting with a magneto-resistive glove device. In this particular implementation, "traditional" positional tracking VR gloves were retrofitted with electromagnetic rod structures which could be stimulated via an electrical signal to move out of a sleeve, and then retract back in again. By creating a vibration pattern against the users finger tips, an entire variety of various tactile surface emulations could be generated, ranging from a "bumpiness" factor, to a "rolling" sensation, or the effect of an "edge object" with varying sharpness attributes.

In fact, the combination of various addressable vibrational frequency patterns have yielded a very wide array of potential "feel event objects" with user definable properties. Already the research team at Sandia is looking into

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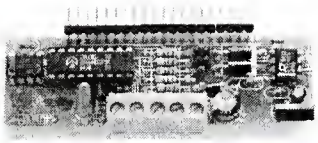

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entire wearable "feel suits" that would stimulate the entire human body via an interactive tactile experience protocol, with libraries of addressable tactile texture models available as part of a virtual presense domain.

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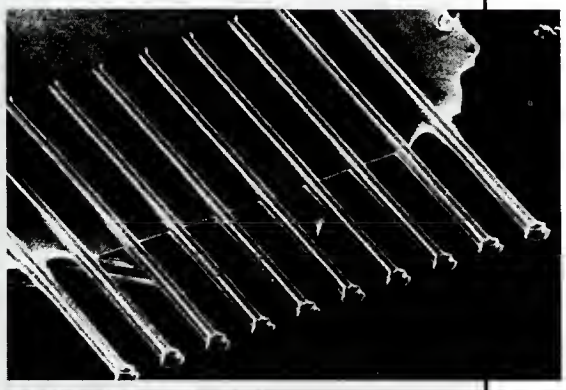
Your Nose on a Chip

by Charles Ostman

— Smell in the VR World —

Things have certainly come a long way since *Tommy*. "See me, touch me, feel me . . ." OK, so what else is new. Smell me? Well, during a latenight chat with a friend, the term "olfactory RGB" came up. I will plagiarize here, since it so accurately captures the essence (no pun intended) of this topic.

Actually, outputting olfactory stimulation from a digitally addressable "smell array" system is not that challenging of an engineering concept — at least theoretically (although a "bug" in the data driving such a system could yield some rather unexpected, if not thoroughly offensive, results). As a general concept, an array of vials with electrically controllable micro valves, as in an 8-bit system with 256 vials, each containing a specific aromatic compound (or the chemical components for a potential compound), could be addressed and instructed to blend specific amounts of a given com-



Magnified view of the microcalorimeter sensor array, which can perform the electronic equivilant function of an electronic "nose." Currently, devices of this type are being utilized in industrial applications such as perfume, food, and wine "sniffing" quality control processes.

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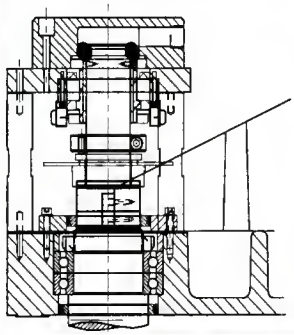

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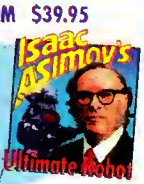

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bination of such compounds into a central container in which the compounds would blend, and perhaps stimulated with a bit of heat, yield the desired "smell."

Smelly Library

In this context, an entire library of smell-yielding combinations of the various compounds in the addressable vial array system could be part of the event cue driven data stream of an interactive virtual world environment.

But what about "smell input?" What if, for instance, you wanted to provide interactive "olfactory telepresense" content? Well, at least one research team has produced the micro-electronic equivalent of a "nose on a chip."

At IBM's Zurich laboratory, a series of micromechanically manufactured calorimeter "chips" have been fabricated which have successfully detected extremely minute concentrations of various chemical compounds both in gaseous and vacuum environments.

The device is actually a microcalorimeter array, consisting of 400um long flexible cantilever tines, somewhat resembling a micro scale comb assembly. The tines of the comb are coated with a molecular layer of aluminum, upon which is then applied another molecular layer of a selected chemical substance, chosen to be reactive to a particular chemical or class of chemical compounds that the device is chemically tuned to be sensitive to. When the molecular coating encounters a trace amount of the chemical(s) it is designed to respond to, the chemical reaction instigated generates a small amount of heat, which in turn deforms, or bends the tine structure.

Thus, a direct correlation between targeted chemical exposure and the range of tine deformation can be translated into a very precise determination of the presense of a particular chemical substance, and in what specific concentration.

A comb-like array of these chemically sensitive tines can be configured to detect a very diverse range of airborne compounds, which is, of course, what all scents consist of. The actual deflection of the tine(s) from their rest position can be optically detected or measured via piezoelectric output. A variety of such "smell detector" chip arrays have been successfully demonstrated.

Solid State Smell

But the quest for micro-electronic "smell detector" devices doesn't stop here. In an entirely different, but equally unique and interesting approach, is the recent development of ChemFETs, or Chemically sensitive Field Effect Transistors. Several research teams, such as the group headed by Dr. Filde at Northwestern University, began exploring this concept in the late 1980s. The primary focus has been to develop an ever increasing collection of chemically reactive, conductive materials that could respond to a particular chemical stimulus.

Field effect transistors can behave as a very linear voltage controlled "gate" device, or conversely, the current flow from the device's source to drain can be controlled by a voltage applied to the device's gate. Or, in the case of a ChemFET, a chemical response affecting the conductive behavior of a chemically sensitive gate material.

The molecular porosity of the gate material, which acts somewhat like a dynamic ion filter, thereby controls source to drain current flow, and thus provides a remarkably linear "targeted" chemical concentration to output voltage function. Depending on the chemical constituents of the gate material (quite a variety of such materials have currently been developed), an array of ChemFETS can be fabricated on a single wafer device, very much like a typical computer chip, which will be reactive (and therefore sensitive to) a array of various airborne compounds.

Investigation into the general realm of ion selective membranes, or ISEs, which has included a variety of organic materials, including fatty acid based Langmuir-Blodgett films, has led to the development of ISEFETS. ISEs and related ionophores, examples fabricated with valinomycin and similar com-

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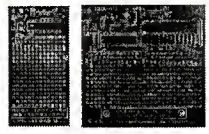
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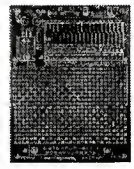
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pounds are particularly interesting because they provide a very ion-selective mechanism which minimizes reactive interference from other ions in a contact solution or gaseous medium.

Furthermore, research at Microsensor Systems, Springfield, Virginia, has taken this realm a step further into the development of extremely sensitive micro-scale standing acoustic wave, or SAW filters. These filters have been fabricated with ISE material coatings. Even though their current applications are in the realm of immunosensory devices, the potential for a gaseous medium chemical vapor detection array is currently being investigated.

Off-The-Shelf "Nose in a Box"

Actually, you can have your very own electronic sniffer attached to your computer, and it will "smell" for whatever range of aromas that the selected sensor array has been installed to detect. Neotonics Scientific (Flowery Branch, GA) now offers its latest olfactory to computer interface system: NOSE (Neotonics' Olfactory Sensing Equipment) originally was developed for industrial and commercial applications, such as detecting extremely minute scent variations and content in materials such as perfumes, liquor, and various food products. The purpose of an automated, high accuracy aromatic content detection process is to replace the human "professional sniffers" traditionally employed for this purpose.

The sensors are made of electrochemically grown polymer materials, usually variants of polypyrrole. Each sensor is chemically tuned for a specific range of aromatic stimulation compound types. Therefore an array of sensors can cover a diverse range of smell response input stimuli.

Furthermore, the electrical response signals generated from the probe array are then input into a neural net signal process engine to provide a highly detailed, smart response "smell event" signature.

Consider the potential advent of "smell phones" . . . gee, and I was just adapting to the idea of ubiquitous video phones sometime in the near future.

Contact References:

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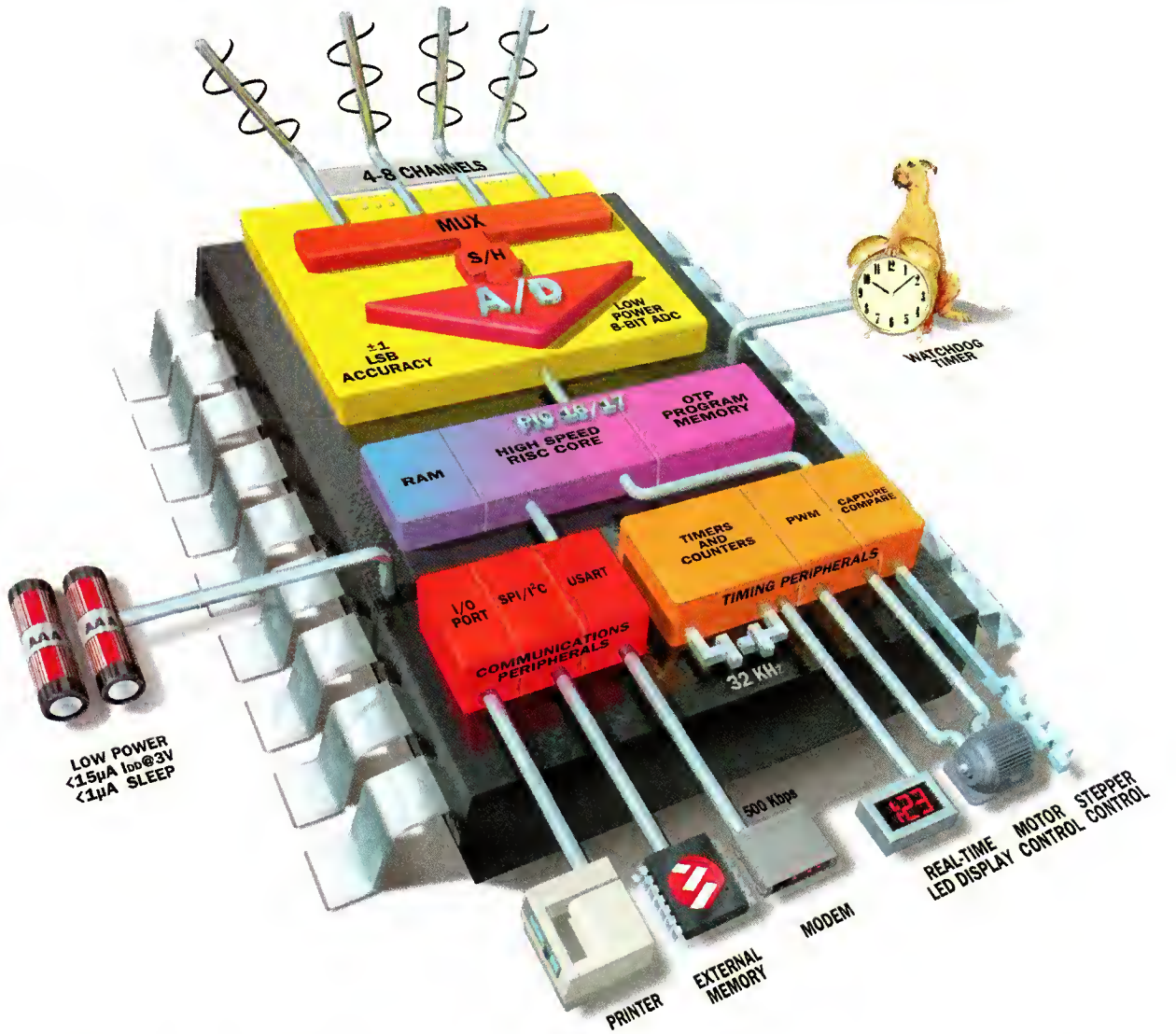

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Reader Service Number 14

Windows 95 Upgrade?

© 1995 by David Holland-Moritz

Microsoft would like you to believe that Windows 95 is the essential operating system for your business PC. Is Microsoft right, or should you stick with your current DOS or Windows system? I do a significant number of business PC upgrades for folks with that very question. This is my take on the question of Win95 on your business PC.

After wading through the advertising hype,the features sound attractive: Long File Names; 32-bit speed; true preemptive multitasking; efficient memory management; Plug N' Play automation; printer sharing & networking support. Perhaps most appealing is the promise of a "robust" operating system that tames those annoying General Protection Faults. So it's tempting to take the plunge and upgrade your business PC.

You might get lucky. More likely, you will have to tweak the configuration settings by hand.

But your cautious side holds you back. What about compatibility with your old Point of Sale software? Or your accounting/inventory system? You ask yourself "Can I still print checks on my old line printer? Do I need new device driver software? Will it recognize my obsolete video card/mouse pointer/barcode scanner...?" After all, this is not just any old computer we're talking about; your business runs on it!

It's a waste of time to debate this issue very long; you soon will have no choice. Think: can you buy a stock PC today that does NOT ship with Win95 pre-installed? What do you expect to find next year? You will use Win95 in your business PC. It's just a matter of time.

I have recently upgraded several business PC systems (including my own) to Windows 95. This has involved both single PC systems as well as small (Novell) networks. The experience taught me how to minimize the pain of transitioning PC systems from DOS or Windows to Windows 95. Here are the most important things you should know about Windows 95 BEFORE you upgrade.

Compatibility

Microsoft went to a lot of time and expense to make sure that Win95 is compatible with your existing MSDOS and Windows applications. This was necessary for the success of the product, and important from the buyer's perspective as well: nobody likes the idea of being forced to upgrade their entire software library when they upgrade their operating system.

But there is no magic here; Win95 is compatible with these applications specifically because it runs them in environments that are fundamentally no different (hence no better) than the original ones. Win95 is compatible with your DOS program because it runs the program in a "virtual machine" that looks and acts just like a standard DOS environment (complete with 640k memory limits and LOADHIGH work-arounds). And even though Win95 is a true preemptive multitasking operating system, your old (16 bit) Windows applications all run in a single "virtual machine" that is essentially no better at multitasking than Windows 3.1 is. It has to be this way for Microsoft to guarantee compatibility with thousands of programs that it's engineers did not design or implement.

Thus, if you have some RAM-hungry DOS programs that force you to use MemMaker (or equivalent) to load everything high, don't expect Win95 to improve the situation much. In fact, it can be tricky to run MemMaker effectively after you've installed Win95.

Long File Names sound great don't they? No more cryptic names like P33A95Q3.RPT crammed into 8.3 format. Well, yes and no. Don't expect "Project 33 Annual Sales.Report" to magically appear in your existing DOS or Windows apps. Until you replace them with their 32-bit versions, they will still display that file name as something nearly as cryptic: PROJEC~1.REP. Plus, if you use your favorite DOS or Windows utility to copy or move that file, don't expect the long filename to propagate to the target file.

New Features, Old Problems

Multitasking: it sounds great. Just what you need when your Windows accounting package is 30 minutes into a 45 minute print job and a customer is on the phone demanding to know the status of his order. You can just start up another instance of the accounting program and check the database...right? Well, maybe. If you can do that now when running on Win31, then you'll be able to do it in Win95. But if you can't, don't expect any magic. The customer will just have to wait until you upgrade your accounting package to the 32-bit version (which the sales rep says should come out "really soon").

Crash protection: no more restarting to recover from General Protection Faults, right? Undeniably, Win95 is more robust than Win31 (perhaps this is due more to Microsoft's

lengthy beta-testing of Win95 than it is to any genuine advance in operating systems technology). You will find that Win95 will effortlessly run many programs (games in particular) that were either difficult or impossible to run under Windows.

But don't disconnect the reset button yet. While it is unlikely that a misbehaving program will actually crash Win95 itself, it may still cause side effects that require you to shut down Win95 in order to recover. As an example, the device driver for our new color printer has an acknowledged bug that often crashes the Win95 print spooler (SPOOL32.EXE). After a crash, Win95 cleans up by removing SPOOL32 and sure enough, it keeps right on ticking. But it's difficult to print without the spooler, and there's only one way to reload it...

Plug N' Play automation! It works great if you've got the latest PNP-compatible equipment fresh from the vendor. But do you really think Windows 95 will find and configure all your custom/unique/obsolete hardware, identify address and interrupt conflicts, and then resolve the conflicts in an intelligent way? You might get lucky. More likely, you will have to tweak the configuration settings by hand. This is relatively easy with the standard Win95 configuration tools, but you will need to budget time to familiarize yourself with those new tools.

Device Driver Problems

Similar problems exist with your older device driver software. This is the software that communicates directly with your computer's equipment. Even though Win95 is designed to be compatible with your current Windows device drivers, you may need to update them anyway when you install Win95.

For example, consider your current backup system. It doesn't matter what type you have: tape, writable CDROMs, whatever. If you want to back up and restore long filenames, you will need new device drivers. Check with your vendor for availability before you upgrade.

Consider also the following "hypothetical" example (based on real experience). Let's assume your PC includes a CAD drawing program. To maximize your productivity, you're using a digitizing tablet with the CAD system. Naturally, you have also configured it as your Windows mouse pointer. This works fine under Windows 3.1.

You're not surprised when Windows 95 doesn't auto-detect the tablet (after all, it's several years old). Your not worried; Win95 has a button labeled "Have Disk..." Click on it, and it guides you through the steps of loading the drivers from your setup disk. Sounds great until you try it. Then you find that Win95 won't recognize the setup program on your disk as a "proper" setup file (it runs fine under Windows). No matter how hard you try, Win95 will not install the tablet drivers.

Next you try to install the driver files by manually editing your system files (even though this is not a recommended practice). This gets the tablet to work correctly as a mouse within Win95. But now the tablet locks up every time you switch into your (DOS- based) CAD program.

To fix these types of problems, you will need an updated setup disk from your equipment vendor. This is a minor problem if you have relatively new or popular hardware with lots of vendor support, and time to wait for the vendor to

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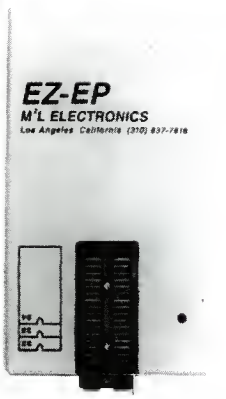

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release updated drivers. But with custom/unique/obsolete equipment, you're on your own.

When to Upgrade

At this point you may be thinking "Why bother to upgrade? I'm satisfied with my current system, even though it is a little slow/inconvenient/obsolete. I'll just wait for all the 32-bit versions of my favorite applications to mature and then make the move." For many this is the best approach. If you're still unsure, answer the following questions:

1. Do you use the PC for more than one application? If you do, then Windows 95 will make it significantly easier to rapidly and reliably switch between your applications.

2. Do you have more than one computer in your system? Do they share printers or scanners, etc, now? With Windows 95, you can throw out that old A/B switch box.

3. If your current system does NOT share printers, scanners, etc, would it help you if it could? Note that such sharing includes hard disk space as well. With Windows 95 on all your machines, you can buy just one hard disk and let all your computers access it, just as if it were installed in each machine.

In short, if you have a standalone PC that runs only one application full time and does not need to share hardware resources, don't bother with the upgrade. Have confidence that you will be able to port that single full time app to Win95 when forced to, and you lose nothing by delaying that transition for as long as possible.

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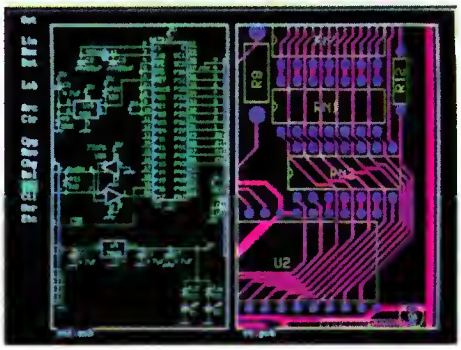

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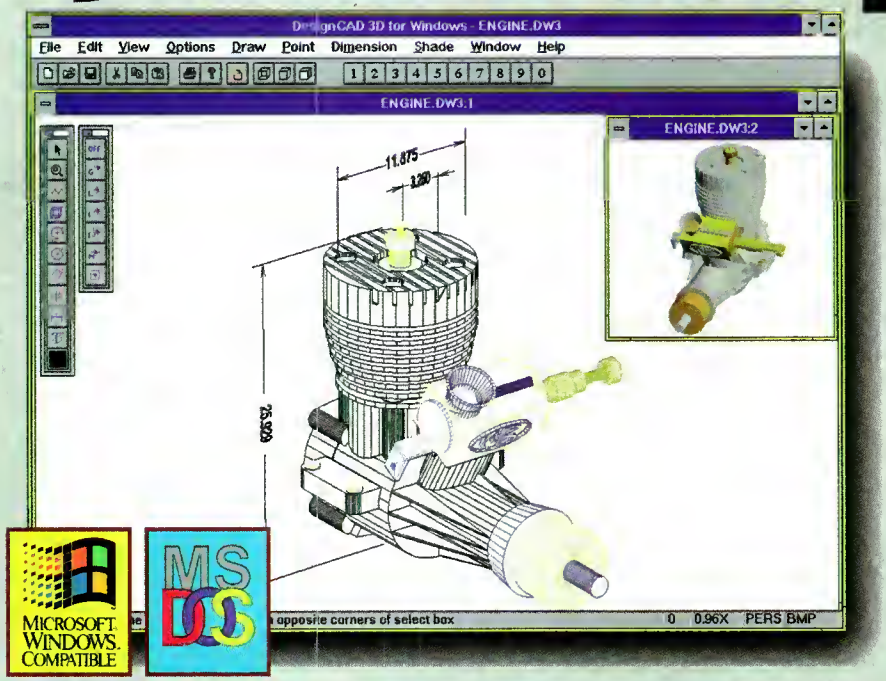

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Conversely, if your business system involves more than one PC or you use your single PC for many different tasks, Windows 95 will improve your efficiency. It will also enable you to easily share data and peripheral equipment among those PCs without additional software. This built-in connectivity support alone justifies the cost of the upgrade of approximately $89.

Upgrade Tips & Traps

Ok, you've decided that your business PC will benefit from the Windows 95 upgrade. Upgrading should be simple, right? You just insert the disk, type a command or two, choose the defaults, and let SETUP do the rest...

Think again. Microsoft developed the installation program with Joe Consumer and his home computer foremost in mind, not you and your business system. Don't expect the default installation choices to be best for you.

If this PC really is critical to your business, you can't afford to shut down operations while you tinker with your new operating system and all its quirks. What you need is the safest, fastest way to install the upgrade without disrupting your current system.

Choosing the Right Option

The installation program gives you a fundamental choice: you can either replace your current Windows installation with a Win95 near- equivalent or preserve your current Windows configuration by installing Win95 to a different directory (like C:\Win95).

If you elect to replace your current Windows version, the setup program will automatically convert all your installed applications (program groups) to Win95 equivalents. This non-trivial feature does a commendable job of preserving user preferences, screen savers, etc across the upgrade.

If you elect to preserve your current Windows configuration. all you get is the stock Windows 95 accessories. None of your favorite hotkeys, tools, utilities, organizers, etc, will be available. Microsoft recommends that you reinstall each of your applications to get them back. When you do you often lose any personal preferences and historical data stored by the application. You'll also use more disk space since you need to support two Windows directories on your hard disk.

Doesn't sound like a very attractive option, does it? Most people will choose the replacement option simply to avoid having to reinstall all their applications. The Win95 setup program even discourages the preservation option with warnings and disclaimers. Why would anybody want to preserve their existing Windows configuration and install Win95 to a new directory, anyway?

YOU do, if you depend on your PC system for your business. There are several important reasons why you should not take Microsoft's advice on this.

1. While the automatic conversion feature is impressive, don't expect it to leave you with an optimal driver and memory configuration. The intent of the feature is to leave your system as unchanged as possible. Is that really what you want when you buy a new, "high tech" operating system? You can often get better performance by letting Win95's "Hardware Wizard" find and configure your system itself.

2. If you install Win95 to a new directory, you are automatically given a dual boot configuration. This means that you can choose to boot the PC into either Windows 95 OR your previous Windows system whenever you restart the computer. This is not possible if you choose to replace Windows.

3. You can manually port most applications from Windows to Windows 95 without too much trouble (porting any DOS application is trivial). Manual porting preserves all your preferences and historical data. Windows 95 even has built-in tools that will do much of the work for you.

4. You probably have a lot of old applications that you really don't use anyway. If you reinstall or manually port only those applications that you really use, the result will be a less cluttered, more efficient system.

If you plan to upgrade with minimal downtime on your business- critical PC, you NEED the dual boot configuration. With dual boot capability, you ALWAYS have the option of rebooting into your previous Windows system. Everything will work EXACTLY as it did before the upgrade.

This capability allows you to gradually transition your system into the Windows 95 environment. If you encounter a problem with an application in Win95, you can always reboot into your old system and run it from there. It will work just like it used to. You can find and fix the problem later, at your convenience.

Add New Hardware First

Do any new hardware/RAM additions BEFORE you upgrade to Win95. This allows you to install and test your new hardware incrementally, with minimal disruption of your business. Perform the upgrade only after the new hardware is working and you're comfortable with the new configuration.

If you want a full install with dual boot capability, you should have plenty of free hard disk space before you start (more than 100 MB). Spend the time and money to add another hard disk if you need to. With 1 GB hard disks available for under $300, you really have no excuse.

CDROM Issues

Do you have a CDROM drive? If you decide to add a second hard disk, be aware that it will bump the CDROM drive letter down by one (in DOS, the CDROM drive letter must be further down the alphabet than all local hard disks). If you have already installed CDROM applications, adding another hard disk will probably break them since they don't expect the CDROM drive letter to change.

If you don't have a CDROM drive now, consider getting one before you upgrade. The CDROM version of Win95 has several advantages over the floppy version:

1. You get extra tools and utilities on the CDROM version, including network administration tools and a special version of the installation program (NETSETUP.EXE). It installs Win95 to a network directory such that it can be used simultaneously by multiple workstations on the network. This minimizes the amount of disk space needed at any one workstation, and also makes it easier to propagate upgrades to all workstations.

2. The floppy version uses Microsoft's special disk format, so the disks cannot be copied with the standard tools (diskcopy.exe, xcopy.exe, etc). You'll have to use a special command (extract.exe) to back up the floppies, and the destination will have to be a hard disk or something that has at least a 20 MB capacity.

Broken Batch Files

Do you use complex batch files to make it easier to run finicky DOS applications? For networked PCs, do your login scripts set up a complex set of environment variables and drive mappings? If so, expect these all to be broken. You'll need to edit your batch files and rethink the login sequence to accommodate Win95.

A Warning About Network Security

Is your PC is on a network? Be aware that if you are not careful, Win95 can open large holes in your network security. In its default configuration, Win95 will remember your network password the first time you enter it. It will then use it whenever it needs to connect to network resources. This "password caching" is convenient when you don't like retyping your password often.

By default, you also have to enter a password whenever Windows starts. If you don't like this, it is trivial to disable: simply set your Windows password to a blank string. This removes the password check from the powerup sequence.

If you choose to disable the Windows password after you have given Win95 your network password (often without realizing it, by simply logging in from within Win95), you have just opened up your entire network account to anyone who happens to turn on your computer!

Since Windows now knows your network password, it will quietly use it anytime your computer needs to access the network. But since you disabled the Windows password, Win95 has no way to verify that the person using your computer is really YOU. Now even your janitor has full access to your network account. Scary, huh?

It is possible to disable password caching in Win95. In fact, Win95 has generally good support for network administration and security, including recommended procedures and rollout schedules. But the default, stock Win95 upgrade product won't give you security by default. This is one of the main reasons that most major companies are still reluctant to upgrade their corporate PC systems.

There's my story on the risks and benefits involved with the upgrade to Win95. Whether you have decided to upgrade now or wait, I hope this helps you perform the upgrade with minimal impact to your business operation.

ME

David Holland-Moritz is an MSEE controls systems engineer specializing in process automation, embedded systems and PC-based industrial control systems. He welcomes comments/questions via email at dhmsjs@primenet.com

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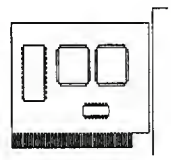

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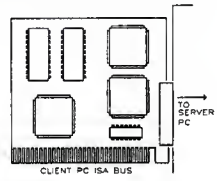

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Budgeting For A Utility Patent

by Curtis L. Harrington

Patents rights are a valuable part of the business of innovation and improvement. Small businesses and inventors need to have an understanding of patent procurement cost and timing in order to adequately budget such expenditures. It is helpful to consider the patent process in three stages, including application preparation, application prosecution, and patent issuance and maintenance.

The costs for preparation of a utility patent varies depending upon the number of pages needed to describe the invention, the number of claims needed to adequately claim the invention and the number of drawings, if any, required to illustrate the invention. The utility patent application includes a background, summary, brief description of the drawings, detailed description, and claims written in a specialized format.

Having a patent can not only form the basis for an income royalty stream, but can enhance product sales and profitability.

One objective measure of the attorney fee cost is dollars per page of patent application including the claims and abstract. This should cost no more than $100 per 8 1/2 x 11 inch page, double spaced. Rarely can even the simplest patent application be adequately expressed in less than 15 pages, and a simple patent seems to average about 20 pages to cost a total of about $2000 in preparation fees.

The current utility patent filing fee, based upon the minimum number of claims, for an individual or business having less than 500 employees, known as a small entity, is $375.

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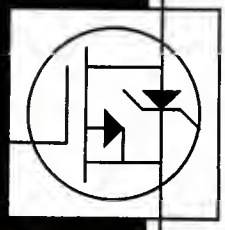

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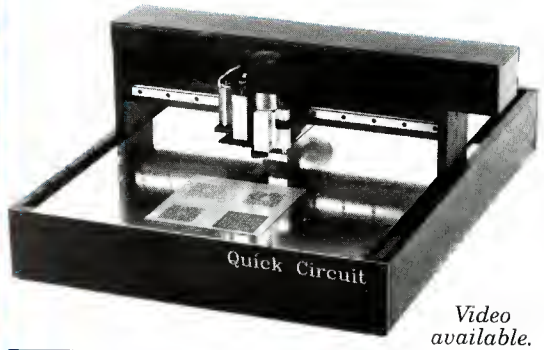

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Quality drawings, if required, are about $150 per sheet. The average minimum electrical or mechanical application may have about three sheets of drawings, so an estimated cost of about $450 for drawings is reasonable. Note that most chemical applications do not require drawings. Based upon these assumptions, the cost to get a simple patent application filed is about $2825. This initial cost is normally paid prior to the filing of the application.

The prosecution of the patent application may involve one or two responses to an examiner in the U.S. Patent Office who rules on the allowability of the patent. Based upon an average of about 2 responses, it may require from 35 hours of attorney time at a cost of $1000 representing the cost of prosecution. This cost occurs from about six months to more than a year and a half after the patent is filed. Of course, unusual situations can require more involvement, but the examples given tend to express a minimum to average case.

One option which has been increasingly used since the change in the potential patent protection period to 20 years from filing, is the use of a petition to enable the application to be examined right away. Since every day of delay before patent issuance costs the owner a day of patent monopoly lost, the time of pendency of the applicationoccurs at the expense of the patent protection period. The cost of such a petition varies widely based upon the basis for application and will not be considered in this budget.

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The government charges post issuance fees due at 3 1/2, 7 1/2, & 11 1/2 years, which are currently $495, $995, and $1495, respectively, for a small entity. The inventor can arrange at case issuance to pay these costs directly or he can have the attorney docket the issued patent and handle the post issuance fees in the future. If the maintenance fees are paid directly by the inventor, the maintenance fee phase adds to $2985.

Based upon the above estimates, the costs throughout the life of the patent total $7735. Remember however, that the inventor may interrupt the patent process, as well as the payment of the maintenance fees, at any point during the pendency of the patent application or during the life of the issued patent. As such, the inventor need only commit to the funds necessary to take care of each phase in the patent process if possible and as it occurs. With regard to the issued patent, the patent owner need only continue paying the maintenance fees if the value the patent monopoly during the next maintenance period exceeds the next maintenance fee.

Remember that the above costs relate to a 20 year period which includes the pendency of the application and the life of the resulting patent. The projected costs should be justified by

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considering the possible additional income made possible by an issued patent. Having a patent can not only form the basis for an income royalty stream, but can enhance product sales and profitability.

ME

Curtis L. Harrington is of Counsel to the Newport Beach law firm of Hawes & Fischer (714)374-9549 and practices in the areas of Patent, Trademark, Copyright and Trade Secret law, and is an Adjunct Professor at the University of Phoenix in Southern California. He is admitted to practice before the state bars of California, Texas, and Arizona, and admitted to practice before the U.S. District Court, the U.S. Court of Appeals, Fifth and Ninth Circuits, the U.S. Supreme Court and registered to practice before the U.S. Patent and Trademark Office. His education includes a B.S. Chemistry (Auburn University, 1974); M.S. Chemical Engineering (Georgia Institute of Technology, 1977); M.S. Electrical Engineering (California State University Long Beach, 1990); a Master of Business Administration (University of Oklahoma, 1985); and Juris Doctorate (University of Houston, 1983). He is a member of the Long Beach Bar Association Board of Governors, the Orange County Bar Association and the Japan America Society of Southern California.

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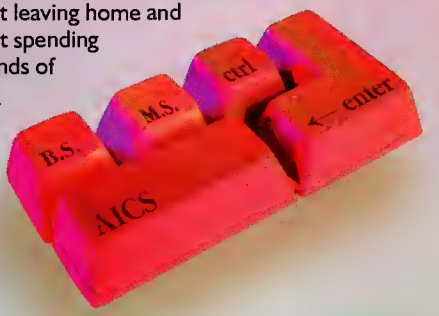

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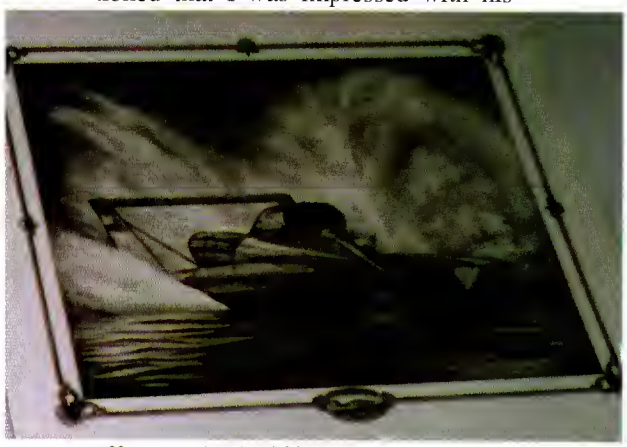
Solar Racer — 1

by William E. Gates

Both Sides of the Brain

During the late night return trip from Denver, after printing the last issue of ME, I stopped for coffee in Monument, CO (near Colorado Springs). In a booth across the aisle from me was a thirty-something fellow working away on a drawing of some sort that I couldn't see from my position. Several people stopped to look at his drawing on their way out of the coffee shop, so when I got up to leave, I walked the long way around so I could see what he was sketching.

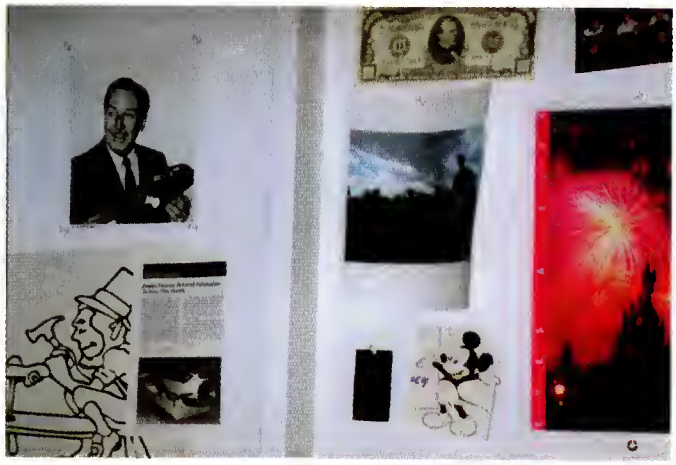
It turns out he was doing a pencil sketch of the Budweiser hydroplane racing boat — sort of like a catamaran-style water-based Indy race car powered by 1000+ hp aircraft engine. I mentioned that I was impressed with his



efforts and asked if that was his line of work. His response was, "Well, I do a lot of things." That started a good two hour conversation between two innovative guys that just happened to pass each other's way in a coffee shop, off the freeway, late one Sunday night.

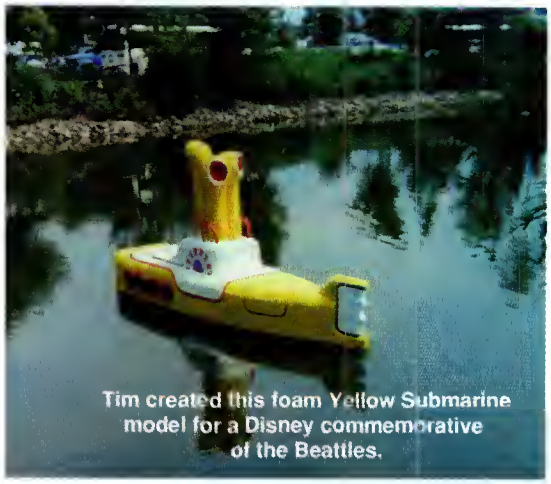
I get to meet some interesting fellow entrepreneurial engineers along the way to publishing each issue of this magazine, but Tim Eckert is definitely one of the more interesting people I've met in the last few years. Tim is a fellow that has both sides of his brain engaged 110%. He is an accomplished artist *and* inventor. Tim has what so many inventive folks lack: the ability to make his vision real at conception. He creates professional level renderings and models of his ideas with deceptive ease.

His inventive ideas flow with equal ease. And, they are not just notions — Tim thinks "all at once," or holistically. I've seen this before. In fact, one of my sons, Michael (13), has it and it can be a real joy if you recognize and appreciate that form of thinking. But, for the person who thinks that way, it can be a problem. Everything is at once a clear and panoramic picture in their mind and they can see way down into the picture. It takes thousands of words to express a brief holistic insight. And so, these people are often seen as verbose and unstoppable. The situation begs for a medium other than speech for communication. The ability to think in this way must be one of the primary elements of true genius.



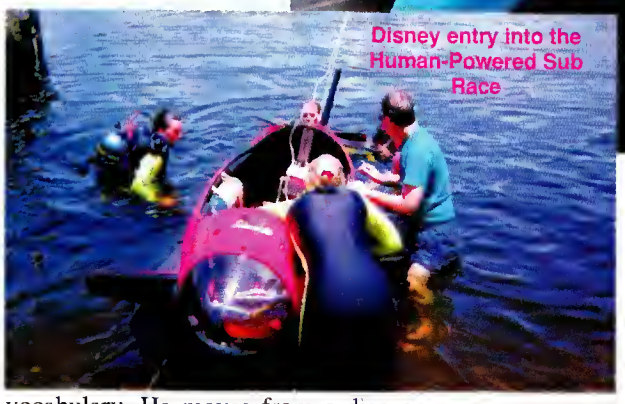
When Tim and I were talking, our conversation had that timeless intoxication you see in two children that have become best friends — yet we had only

known each other for a few moments. To others we must have sounded childish, jumping from his background to my present. Then jumping again to his present, then to my background. In short order, we created a time/experience grid that covered most of the key elements of our two lives over the last 30 years. I was amazed at how the conversation seemed to be propelled along. Where he had artistic abilities that I admired, I had none. Where I had decades of experience with computers, he had none. We both had plenty of our youth consumed by cars — tinkering with and racing them.



Tim created this foam Yellow Submarine model for a Disney commemorative of the Beattles.

Tim Eckert is an entrepreneurial engineer in the primal sense. He is free of the formal higher education and career ladders that limit and inhibit so many people. His education consists of head-on meetings with a wide variety of problems in realworld situations where "you can't do that" limitations are not part of the vocabulary. He moves from a discussion of laminar airflow to brushless motors to hubless wheels with the delight of a child. He seems to have a deep understanding and appreciation of the artistry of realworld physics — to the point of being unnerving. His heros are the likes of Ben Franklin and Leonardo DaVinci, but he operates with the practical intensity of the TV character McGyver and the quiet desperation of a competitive racecar driver. Tim strikes me as a walking, talking ***Popular Science Magazine*** — he has a deep cleverness about him.



Disney entry into the Human-Powered Sub Race

The bulk of his professional work was done at the Disney Studios in Florida as a mold and model maker. Actually he was "the guy with the ideas" that you often see in a place like that. Disney is staffed with loads of creative talent, but Tim was the guy who would start bubbling over with ideas when tossed the difficult problems. Unique materials and processes used in unique ways, coupled with real creative artistry,

Early Eckert Soap Box Derby racer

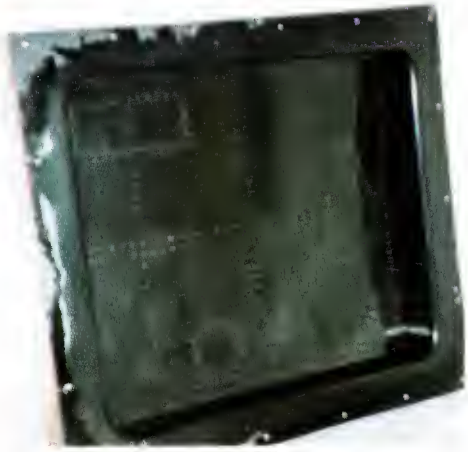
Tim's Pikes Peak Hill Climb entry

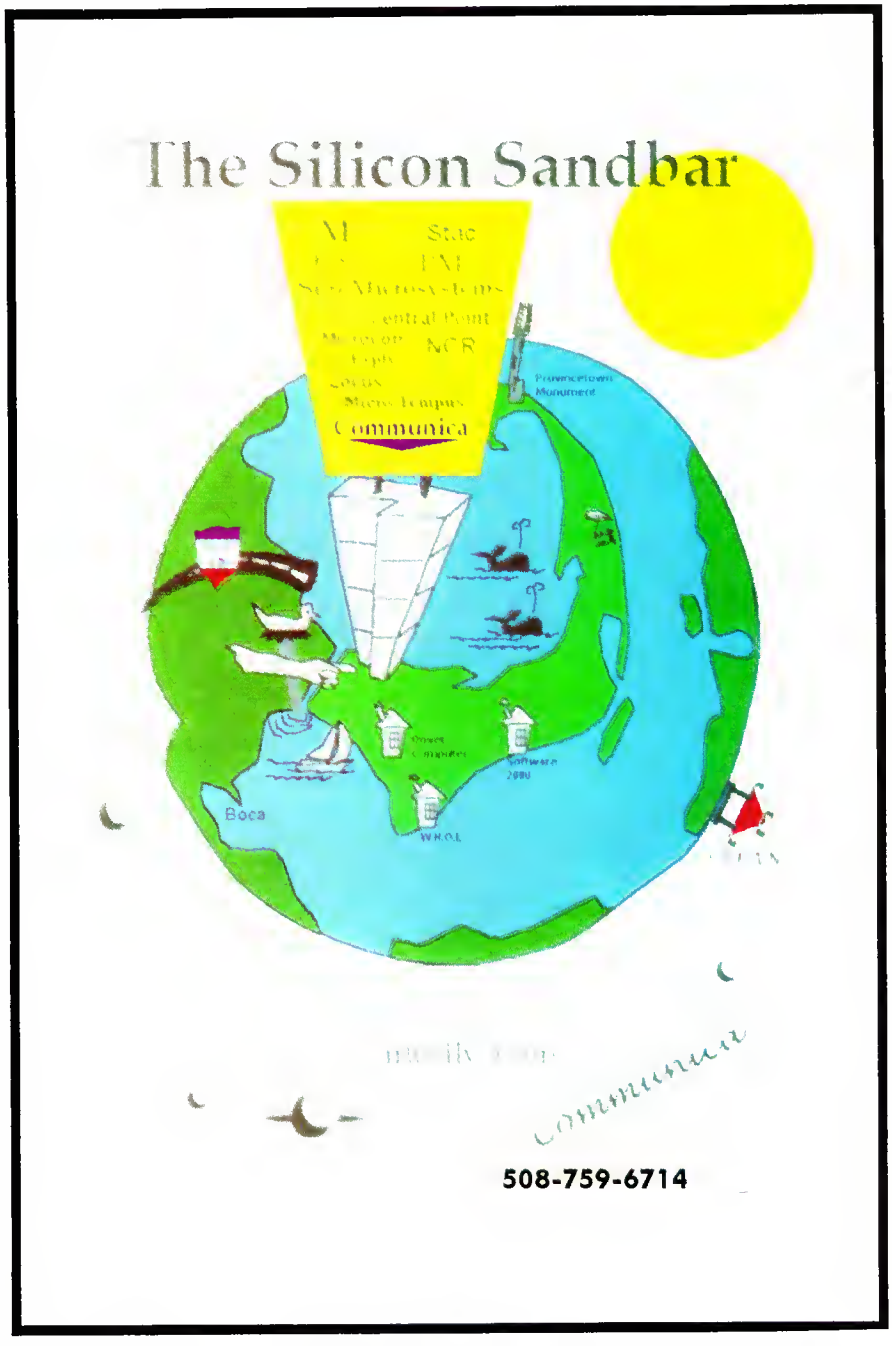
Reader Service Number 99

Tim was intrigued with the concept of a positive displacement pump. He designed and built this prototype to test his ideas.

garnered him special assignments. He worked with state-of-the-art composites, because they were able to deliver the oddball shapes that he needed to implement his ideas. If he needed to weld something, he got help for the first effort, but relied on himself beyond that. If no one was available in new situations, he would simply try to do what needed to be done on his own. His current studio work area in his brother's sign shop is plastered with photos and props from those earlier years at Disney.

WWII bomber nose artworks are Tim's latest moneymakers. Several art gallaries are showing his reproductions that he paints on a fiberglass fuselage "hatch" (complete with rivets) popped out of the mold he built (below).





Reader Service Number 30

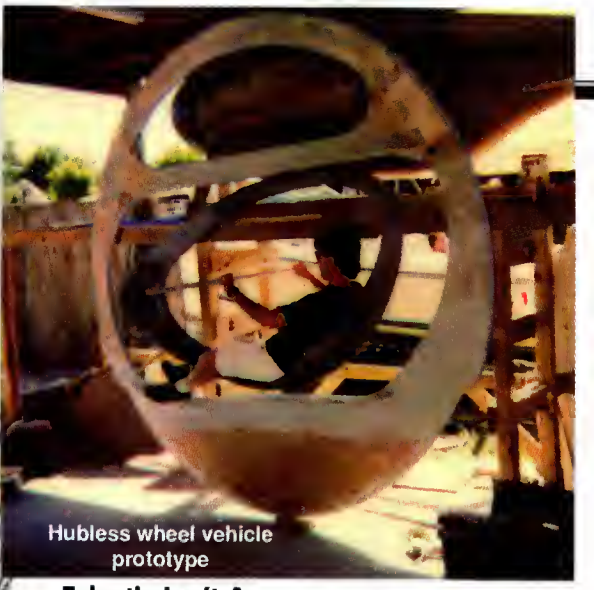
Competitive Edge

Going back even further, Tim was already playing realworld engineering hardball at age 11, when he built a unique Soap Box Derby racer. Where others were limiting themselves with conventional streamlining, Tim substantially reduced the cross-section of the body by making it so slim that the steering mechanism had to be mounted above and outside of the body.

In his twenties, Tim was competing in professional races like the Pikes Peak Hill Climb.

The Quickening

Tim added a new dimension to his work during his racing career. He began to bring projects together quickly. To go from concept to complete racecar in a short period of time was not normal. By doing most of the work himself, he was


Hubless wheel vehicle prototype

able to compete successfully on a shoestring.

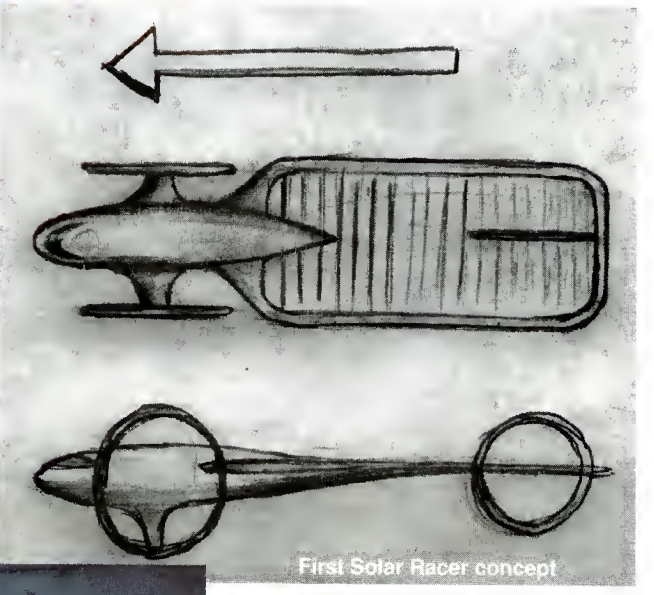
His racecars were built on the farm — literally. The make-do attitude comes from these early years when old farm machinery repair and enhancement formed the basis for his "undergraduate engineering."

Eclectic Isn't A Four-Letter-Word

Wildly diverse and divergent experiences in the real-world are a common thread among unique individuals like Tim. Some of these restless individuals just can't get along with others or conform to the workday world of career employment. But a few, like Tim, seem to thrive on oblique tangents every few years, not placing much of a priority on "security," tenure, and peer acceptance.

For Tim, the Disney years were loaded with new and exciting diversions. Working on many of the models for Disney-World only allowed him to work creatively within the confines of defined projects. But other situations came up, like the Disney entry into the Human-Powered Sub races. Tim could get really innovative here and worked out his own practical ideas on air and water flow.

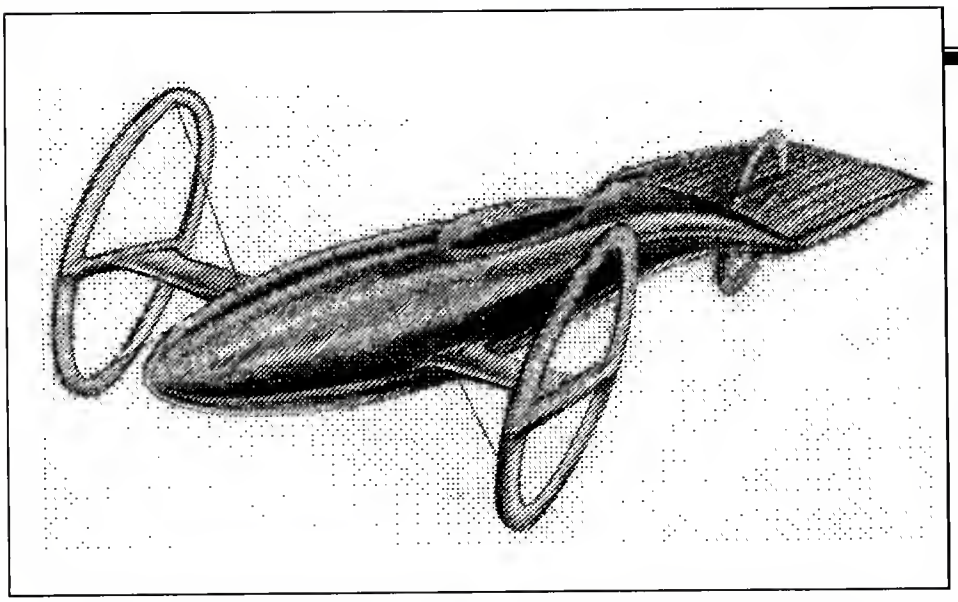
He approaches the problem of air and water flow/turbulence in a manner that could be called


First Solar Racer concept

"turn-of-the century" engineering — that is the last turn of the century, not the upcoming one. Tim dreams up complicated and compound shapes that the computer modeling boys couldn't even think about modeling. To implement such complex shapes, he creates balloon mechanisms that are adjustably-constrained in various ways and inflated to various degrees until he gets the shape he wants. He then sprays the balloon with urethane and presto! You get a very complex shape that would otherwise require Cray processing power.

Recently, when Tim needed to shrink-wrap some of his art for sale, he built his own shrink-wrap machine rather than buy one retail — a bit of nichrome wire and a frame.

Inflated and variably constrained balloon mechanism for developing compound curves, elimates need for Cray.



Tim's most recent design sketch is the basis for the wind tunnel model and the full size mock-up they are building. The model will have 3 and 4-wheel designs to evaluate in the wind tunnel.

Most entrepreneurs today are closely associated in one way or another with PCs. A computer is a foreign object to Tim. "My brother Don uses the PC in his business for sign design and accounting, but I haven't felt the need to involve myself in the computer world. I am able to get everything I want accomplished with traditional tools and my own innovation. Some of the newer programs for the PC do look interesting, though."

Entrepreneurial Superman

Now that I've built Tim Eckert up to be some sort Entrepreneurial Engineering Superman, where is all this going? The answer is: AUSTRALIA. The 1996 World Solar Challenge (WSC) race across Australia (see page 45) is coming up in October and it is definitely too late to even be thinking about entering the $million race where the likes of GM spend upwards of $10 million and several years of the very best engineering talent using the very latest technology. But that only makes the challenge more interesting for Tim.

Originally, Tim wasn't thinking about competing in the race. For several months now, he has been consulting to a group called Colorado Solar Racers (see CSR sidebar). CSR is building a car for the 1996 WSC. They would pose their engineering and aerodynamic problems to Tim, only to find his solutions a bit too unconventional and risky for their blood. CSR is a $million project that has to answer to a governing board and investors. Justification is required for any deviation from sound engineering wisdom.

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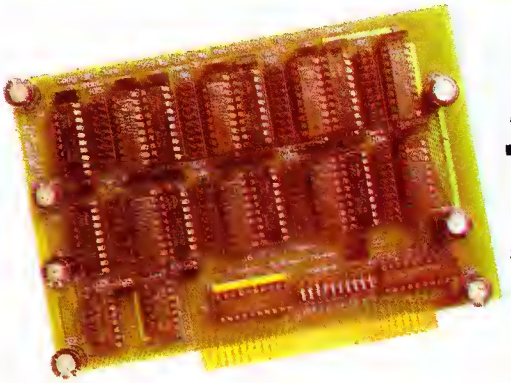

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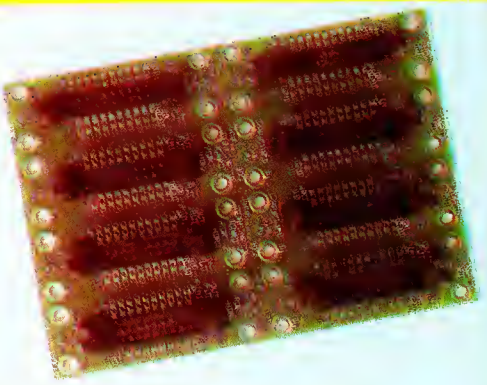

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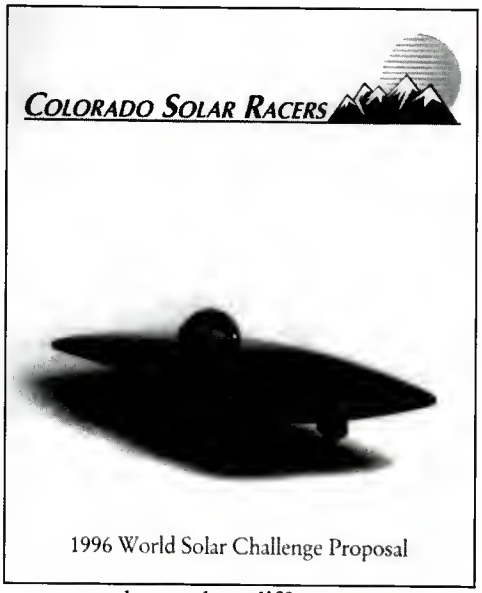
Reader Service Number 72

CSR is already testing their prototype and soon will be starting work on the final car for the WSC race. It is a bit late for radical ideas and risky concepts.

As Tim sees it, there is still a reasonable chance — in his mind only — to field a vehicle for the WSC in 1996. Of Course, the vehicle could only be done in time using Tim's unique rapid development technique: minimal team that doesn't answer to anyone but itself, minimal dollars (much of it self-funded), maximum unique engineering, and plenty of directed intensity.

In preparing this article, I happened to be talking with Tim off and on over the last few weeks of December, 1995. During that time, he and his brother Don were tossing around the idea of entering the race. It was exciting watching them work through the steps (also known as mustering up the courage) of the decision process. What about money? What about time? What if they didn't get done in time? Were Tim's ideas strong enough to make a difference and realistic enough to probably work? Would CSR think Tim was cheating after consulting on the CSR car, or think Tim too much of a threat with his radical ideas, or maybe just think Tim to be completely nuts?



1996 World Solar Challenge Proposal

As it ended up, CSR thought that it was fine if Tim wanted to enter his own car and maybe Tim's Skunkworks approach would have a chance. Maybe they could even ship their cars together and otherwise collaborate for the good of the American teams. And so, we now have a guy seriously planning his entry into a megabuck international engineering

Colorado Solar Racer project (above) and World Solar Challenge 1996 description (below) indicate what Tim is up against.

World Solar Challenge

The World Solar Challenge (WSC), an 1850-mile trek through the middle of the Australian outback, is the most challenging and prestigious solar car race in the world. The race, which has been held every three years since 1987, attracts teams from top companies and universities from around the world.

The 1987 race was won by General Motors with its GM Sunraycer. The Sunraycer, estimated to cost more than $10 million, averaged 44 mph and broke all existing solar car speed records. It sparked the imaginations of people around the world and gave life to the sport now known as Sunraycing. GM and the U.S. Department of Energy brought this new "brain sport" to the United States by sponsoring the Sunrayce competitions for North American college students.

The 1993 WSC winner, Honda Motor Company of Japan, shattered the GM Sunraycer's record with an average speed of 54 mph. Honda's success was attributed to their superior aerodynamics and solar array power. Their solar array produced up to 1800 watts in bright sunlight compared to the 1500 watts produced by the 1987 Sunraycer.

1996 World Solar Challenge

The next race will begin in Darwin on October 27, 1996, and officially end six days after the first team crosses the finish line in Adelaide (approximately 10 days later on November 5). Teams will arrive in Darwin several weeks in advance to test their cars in the Australian heat and make any necessary arrangements for the race. A few days before the race, all teams will be inspected for safety and compliance with the race regulations. The starting lineup will be based on the top qualifying speed of each teams.

Every three years, top teams from around the world come to Australia to race from Darwin to Adelaide, an 1850 miles trek.

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foray, on a shoestring, with several major unproven engineering concepts and no time. And best of all, we have a ringside seat!

Rent the movie *Wind* at your local video shop if you want to get an idea of what this sort of innovative realworld drama can be like. *Wind* is about the renegades who retook the America's Cup in Australia a few years back (funny how Australia keeps popping up). I lucked into meeting Tim and catching the first inning of this game. As the publisher of ME, nothing could be more thrilling than to deliver the play-by-play of a renegade entrepreneurial engineer's first world-class effort.

Tim's brother Don will be one of the early sponsors of the solar racecar. Don's training and coaching in Olympic gymnastics, plus his sign business, will help Tim build and run the racing team.

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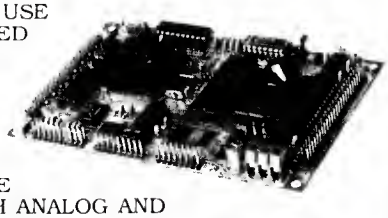

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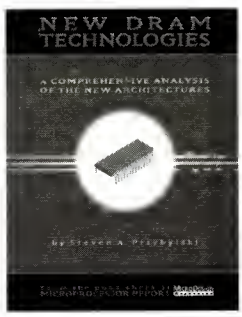

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Tim offered me one of his original lithographs as I was leaving.

Postscript

Since the above article was written 30 days ago, things have progressed rapidly. Tim has finished his preliminary design of the bulkheads and is creating a full size prototype carved in foam. News of his decision to go for it has gotten out in the Colorado Springs area and help is popping up all over the place. Local folks are showing interest in helping sponsor the solar car and a fellow at the nearby Air Force Academy indicated that Tim might be able to test a model of the car in their wind tunnel. We'll have more technical details and some great shots of the prototype in the next issue.

Tim Eckert can be reached at his brother Don's sign shop Signs To Go, 251 Front St #14, Monument, CO 80132, 719-488-9081.

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59C11,85XX,9306,46,56,66
80011A, ER1400/58657

BIPOLAR PROMS• (16-24 PIN)
74SXXX AND 82SXXX FAMILY

MICROCONTROLLERS• (UV,EE AND FLASH)
8741,42,48,49,8751,87C51,8752,C52,87C5XXX
87C75X,89C51,52,68705,68HC705,68HC711E9
PIC16C5X,PIC16C6X,PIC16C7X,PIC16C8X

*ADAPTER REQUIRED - ASSEMBLED ADAPTERS AVAILABLE / DETAILED DIAGRAMS INCLUDED

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•READS INTEL HEX , MOTOROLA S-RECORD AND BINARY FILES
•FAST! - MANY DEVICES PROGRAM IN UNDER 10 SECONDS
•RUGGED (9"X 6"X 3"), PORTABLE ENCLOSURE WITH CARRY HANDLE PRINTER CABLE AND POWER PACK STORE NEATLY INSIDE
•ACCESSORY CONNECTOR FOR FUTURE EXPANSION
•LED INDICATORS SHOW POWER, PROGRAMMING & SYSTEM STATUS
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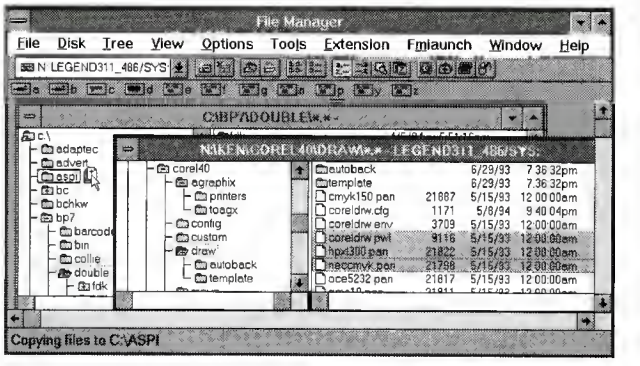
Cheat

on your Manuals

Step 1: Illustrate

Take a picture of every step in the process. Use **EPScreen** for MS-DOS programs or **Snapper** for



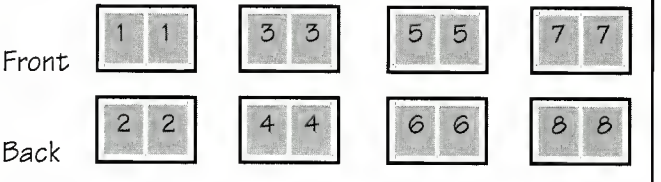
Windows software. Both give you compressed EPS illustrations for the highest quality pictures with the lowest overhead for disk space. Next, bring all pictures into your word processor, using a page size such as 8½×5½ inches (half letter) or 8½×7 (half legal).

Step 2: Write

Add some words to link and explain the illustrations. Include a Table of Contents, Introduction, copyright notices, and Index. Spelchek and pruf your work.

Step 3: Print

Output your document to a PostScript print file and bring it into **Double**^{UP}. Select your paper size and an output pattern. For less than 80 pages, choose **Saddle-stitch** for a booklet you can fold and center staple. If you have more pages, select **Twin** output and halve your printing costs.



Warning: All suggestions require a PostScript printer. Call **1-800-668-7077** for more information on these and our other PostScript software solutions.

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Reader Service Number 19

Microprocessor Development Packages

PIC Point and Click

CodeAx Application Builder
Software & Development Board

$199.00 ea

CodeAx application builder software configures, initializes and performs other software overhead tasks automatically. You choose the microprocessor and accessory boards. Complete your circuit in the prewired prototype area. Click through the screens and set values or accept defaults for your system. Create fully commented source code; add custom code as desired.

Pic-PD Development Board

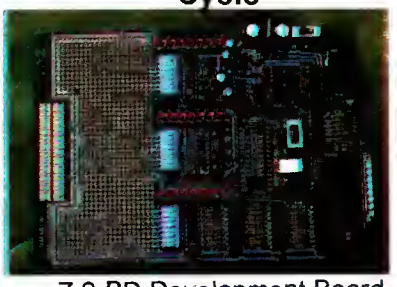
$99.00 ea.

Features:

- Port status LEDs
- Built in programmer
- Proto Area
- Pic 5x,6x,7x,8x Series
- Power supply included
- Includes Assembler

Z8 Point and Click

Learn New Processors Quickly
Reduce Development Cycle



Z 8-PD Development Board

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- Port status LEDs
- Built in programmer
- Proto Area
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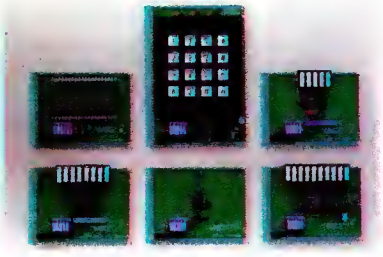
- Power supply included
- Includes Assembler

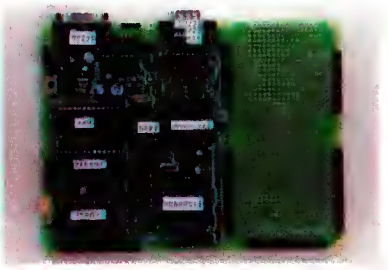


Accessory Boards

Accessory Boards:

- Key Pad
- LCD
- EEprom Storage
- High Current Driver
- A/D Converter
- D/A Converter
- Production CPU

68HC11



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- 8K EEPROM
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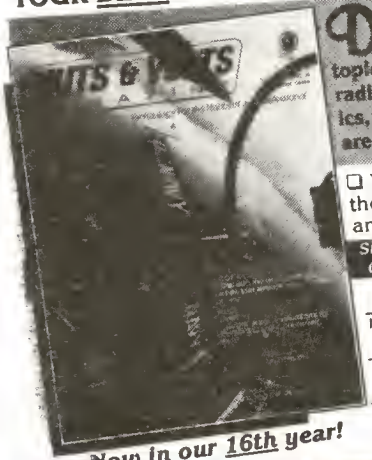

Designed for the hobbyist, each issue is filled with valuable parts & equipment resources, as well as hard-to-find info on topics of interest to the electronics enthusiast. Articles on amateur radio, cellular communications, scanning, computers, amateur robotics, lasers and more along with build-it-yourself electronics projects are just some of the exciting features you will find each month.

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Let Them Handle It

by Alan C. Earnshaw

What should the Midnight Engineer do when the product is only moderately successful and yet you don't want to drop it?

In the Fall 1995 issue of *Midnight Engineering*,, Clark A. Calkins posed this question. By moderately successful, I mean your product is selling well enough that you are spending so much time running the business (fulfilling orders, providing customer support, marketing the product, etc.) that you don't have enough time left to develop new products (which is what you probably prefer doing, anyway). But your product is not selling well enough to enable you to hire someone to take over some of the business tasks.

Companies large and small have been outsourcing certain functions for years, including legal needs, accounting, payroll, and advertising.

I suspect this is a fairly common problem, especially for midnight engineers, independent software developers, and shareware authors (who often find the business aspects of entrepreneurship a dreary necessity). In this article, I will discuss somc of the approaches I've seen that are commonly used to solve this problem.

Outsourcing

Outsourcing is one of the buzzwords of the Nineties. The word strikes fear in the hearts of some corporate drones, who think the word means, "I am about to lose my job." For you, it can mean terrific time savings, access to new talents, more efficient operations, and, sometimes, lower profits.

Stated simply, outsourcing is the process of hiring an external firm to perform one or more of your internal business functions. Companies large and small have been outsourcing certain functions for years, including legal needs, accounting, payroll, and advertising. (Of course, the word "outsourcing" did not come into vogue until fairly recently, and you still will not hear many people in corporate America say they are "outsourcing the company's advertising." Instead, you'll hear them talk about "retaining" or "contracting with" an advertising agency.)

You can find an outsourcing company that will handle nearly any business function you perform. Some commonly outsourced functions are:

- Advertising
- Bookkeeping and Accounting
- Direct Mail
- Legal
- Order Fulfillment
- Order Taking
- Payroll
- Product Development
- Product Technical Support
- Production
- Tech Writing (Documentation)

There are a number of obvious advantages to outsourcing. Mainly, you can transfer some of the hassles from your desk to someone else's. You no longer have to perform the tasks you consider to be a real hassle (you know what they are; they're the things you always put off doing). The tasks you find tedious will almost certainly be different from the ones I dislike. Like most of the programmers I know, I don't en-

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```
                mov   ax,2517h
                mov   dx,offset int_17h_entry
                int   21h                       ; DOS Services  ah=function 25h
                                                ;  set Intrpt vector al to ds:dx
                mov   dx,offset data_4          ; ('Halt when ? printed.')
                mov   ah,9
                int   21h                       ; DOS Services  ah=function 09h
                                                ;  display char string at ds:dx
                mov   dx,19h
                mov   ah,31h
                int                             ; DOS Services  ah=function 31h
                                                ;  terminate and stay resident
                                                ;  al=return code,dx=paragraphs
virustst        endp
                :
                :
int_17h_entry proc    far
                pushf                           ; Push flags
                cmp   al,3Fh                    ; '?'
```

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joy writing manuals for my programs, and I don't really like copying and labeling disks, but I do enjoy designing programs, writing code, and talking to customers on the phone. You may hate talking on the phone but enjoy writing manuals. That's why outsourcing has such appeal: you can continue doing the parts of the job that you like and let someone else handle the other parts.

The other advantage is that outsourcing vendors are specialists in what they do. The ones that take orders and provide fulfillment services have highly specialized computer systems for order entry and tracking, assembly-line style shipping departments, and one or more experts on staff that are intimately familiar with every aspect of their operational specialties.

Outsourcing vendors can also gain economies of scale. They spread the costs of their expensive, dedicated equipment across a large volume of transactions, so they can afford to invest more capital in their systems than most small companies. Direct mail companies (often called lettershops) have very nice economies of scale. Their automatic folding and inserting equipment, envelope printers, sorting machines, automatic scales, postage meters, and mailing permits are far too expensive for most small companies. And even after paying the fees charged by a lettershop (they do have to make a profit, after all), you may end up spending less money on a mailing than if you hired temporary employees and did all the work by hand, especially when the postal discounts are considered.

Although outsourcing is convenient and a nice way to rid yourself of the tedium, there are some significant disadvantages to it as well. The biggest one is cost. Although it can be cost effective to outsource some of your business functions, others are much more expensive than handling the job in house, especially if your volume is low. For example, it is cheaper to hire a lawyer and pay his exorbitant hourly fees than to hire a lawyer full time or go to law school and do all your legal work yourself. On the other hand, the large product fulfillment companies, like R.R. Donnelly, charge a fee for each shipment they handle. They will also charge a lot of other fees, including storage fees, administrative charges, and minimum daily, weekly, or monthly charges. When spread out over thousands of units, their services can be cheaper than handling it all yourself. When spread out over a dozen or even a hundred units, these services will quickly put you in bankruptcy court.

When outsourcing, you also lose control over the process. You may not find out that your fulfillment house is taking two weeks from the time you fax them an order to the time they actually ship the product unless one of your customers calls you to complain (instead of calling the outsourcer's own customer service staff). You also may not find out that the phone reps at your outsourced technical support department cannot answer the simplest questions about your product until

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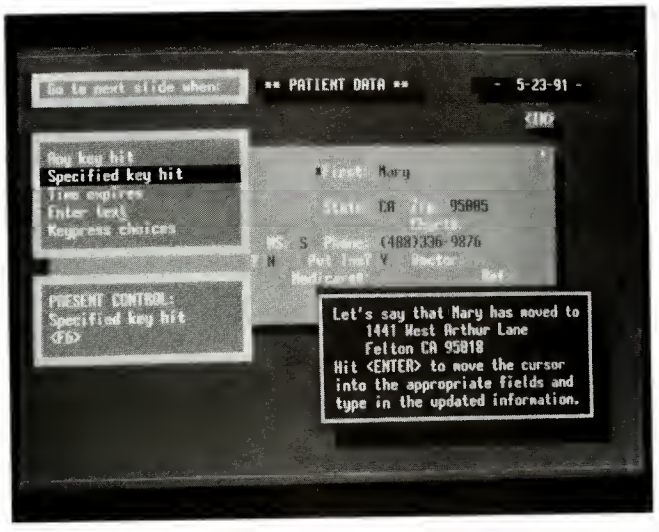

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you hear about it from a customer who visits your trade show booth to complain.

Protecting Yourself from Your Outsourcer

There are several things you can do to protect yourself from your outsourcing vendors, but they require some effort (and usually some expense) on your part. A good contract is the first step. However, the vendors will have their own contracts ready for you to sign, and they probably had talented (and expensive) lawyers create them. An hour of your attorney's time to review the contract could be a worthwhile investment.

If the outsourcer is doing work for you under contract (such as an advertising agency, a technical writer, or a contract programmer), make sure you review their work regularly. If it is not up to your standards, tell them so. But be specific! "This manual is inadequate" is less likely to get results for you than "This manual needs step by step tutorials to show the customer how to use each feature of the product." And if one vendor is not willing to perform to your standards, Adam Smith's invisible hand should be able to guide you to a new vendor.

You can also play the "mystery shopper" game. You pretend to be one of your customers and place calls to your outsourcer to test how well they handle your simulated queries (whether it be product information requests, an order, or a technical support question). Of course, if you pay a fee for each call, this method of testing can get expensive.

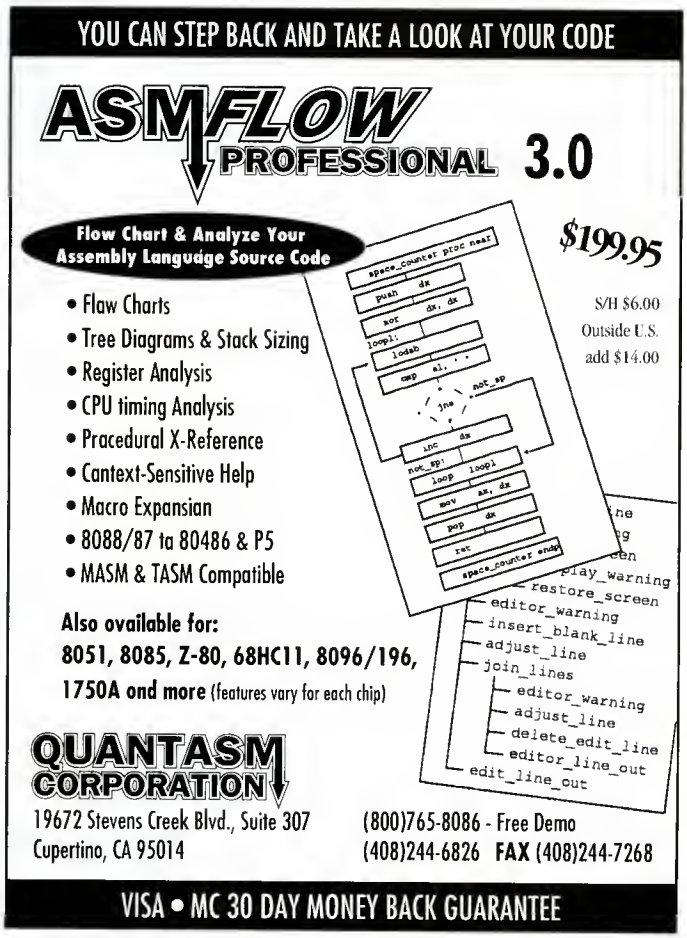
Finding an Outsourcer

Although your volume will probably not be high enough to justify the costs of the big outsourcing firms (like R.R. Donnelly and EDP), there are probably a number of small outsourcers in your area whose rates will be quite affordable and whose service will be outstanding. In my experience, the business functions most readily outsourced are accounting, legal, advertising, and direct mail. If you live in an area with many businesses similar to yours, you will probably find vendors that can handle your production and order fulfillment. To find these firms, check your local Yellow Pages (or the Yellow Pages for the nearest large city).

If you live near a college or university, you may be able to cheaply subcontract (which is another name for outsourcing) a number of tasks to talented and qualified students, including technical writing and graphic design work. When I was in college, part of my course work included doing projects for local businesses. The businesses made nominal donations to the university (around $500, as I recall), and we did hours of research, prepared written reports of our findings, and presented the final report to the client when the project was done. Not bad for a few hundred bucks! You may also wish to investigate university internship programs as another source of cheap (or even free) labor.

If you need a catchy tune for your multimedia presentation or are designing a computer program that needs an original musical score, there are a lot of "starving artists" that you might be able to hire on the cheap for a little contract work while they are waiting to be "discovered" by a record company.

Reader service Number 5



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Partnering

Another way to shift a portion of the work load from your shoulders to someone else's is through partnering. In partnering, you establish a formal relationship with another company, in which they assume certain of your business functions. This arrangement is normally some kind of product bundling deal (i.e. the customer buys the other company's product and gets your thrown in with it). They do all the marketing, order processing, and fulfillment, and you supply the product in bulk to your partner. Sometimes the partner will even be willing to take over technical support for you.

Later in this article, we'll discuss some of the issues you should consider when selecting a partner, but let's first talk about some of the advantages and disadvantages of partnering.

If your product truly complements the product or service offered by the partner, a bundling deal might sell more total units than both products sold separately. If you sell a data acquisition board, you could bundle it with a data analysis software package. Remember, customers want solutions to problems, and a complete solution (with one part provided by you and one part provided by your partner) is more appealing to the customer than just one piece of the puzzle that may or may not work when combined with other pieces.

If you are partnering with an established company, they will already have a database of potential customers for your product, market visibility, and credibility with customers. You could spend thousands of marketing dollars trying to establish the foundation that your partner has already established; why not build on their foundation directly?

However, when you enter into a partnering agreement, you surrender tremendous amounts of control. If the partner has financial difficulties and cannot afford to market the bundled product, your cash flows will dry up instantly. If the partner goes out of business or discontinues or sells the product line into which your product is tied, you will, again, be strained. And if your partner begins losing credibility with its market, your product (and perhaps your company) will also lose credibility, since it will be so closely associated with your partner in the minds of customers.

Sell It Outright

Even if your product is not a runaway success, you may still be able to sell it outright to another company. A lot of companies are interested in broadening their product lines without investing months of time and thousands of dollars developing a product that may or may not bring a significant return on investment. If they can find a product that is having limited success, they can acquire the product and capitalize on the existing markets and customers without having to make the investments to start from scratch. They are, in effect, transferring most of the start up risks to you and hedging their bets. These companies will be most interested in products that are not being marketed effectively, whether due to lack of funds or lack of expertise, especially if the products can be

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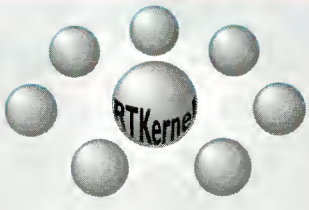

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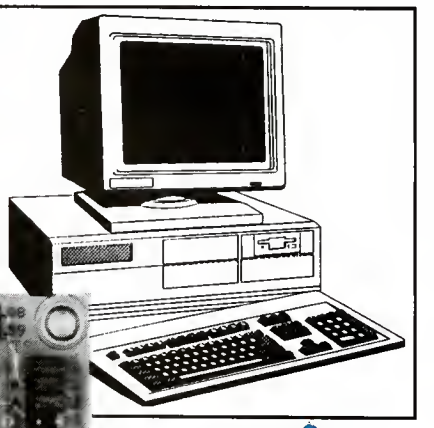

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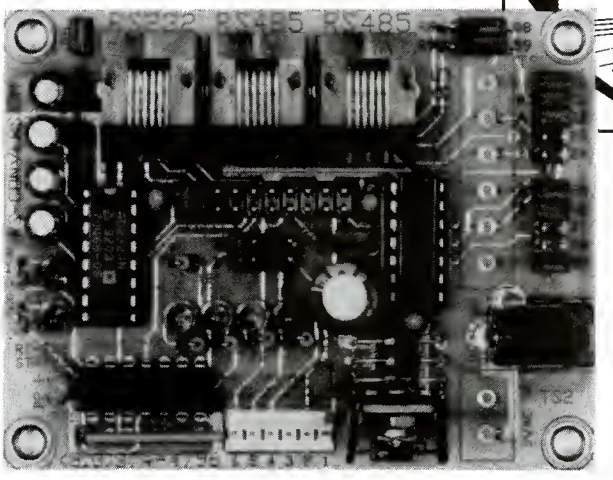

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sold through their existing channels of distribution.

If you wish to sell your product outright, you can try one of two approaches. You can sell the product as it currently stands: circuit board designs, firmware code, program source code, manuals, reference cards, etc., or you can sell the technology used in your product (new methods, formulas, algorithms, etc.). By selling the product, the buyer gets a product it can immediately market with few, if any, changes. By buying the technology, the buyer can use it to enhance their existing products.

Whether the buyer wishes to purchase the product or the technology will depend on their current product line, their business plans and goals, and how your product fits in with them.

If you sell your technology, you may still be able to market your product, and if you sell your product, you may still be able to use the technology in future products. It depends on the agreement you sign, so make sure you work these details out during negotiations with the buyer.

The main advantage to selling a product or technology is that you normally get a lump sum payment when the transaction takes place. You can use this cash to fund the development of your next project, take a nice vacation, pay off your car loan, or whatever. If your product is only moderately successful, you will probably not get a huge amount of money, but the payment can make your life a little more comfortable, at least for a little while.

The main disadvantage is that you will usually not get continuing income from your product. No matter how successful the product becomes, you will never get another dime for your work. (Of course, even if the product fails miserably, you'll still have your lump sum payment.)

License the Product

Another common method of transferring business functions to another company is by licensing your product. Under this arrangement, the other company takes over most or all of the business functions for the product. They will market the product, process orders, fulfill the orders, do the production, etc. Under some arrangements, they can perform technical support, create documentation, and even do future product enhancements. Sometimes, you will be required to provide technical support to the company's support technicians (who will interact directly with the customers); in other cases, you will still be responsible for providing all technical support.

As you can see, this method is similar to selling the product outright. The major difference is that you still own the intellectual property (copyrights, patents, and trademarks) associated with the product. The contract will normally give you the option to terminate the license in specific situations, such as if they breach the contract, so you can seek another licensee if they are not marketing the product to your satisfaction.

With license agreements, you normally receive a relatively small initial payment, sometimes in the form of an advance on royalties. (If your product has had very little success, is in a risky market, or it will take a large amount of cash to develop the market, you may not get an advance payment at all.) You will also usually receive a royalty for each unit sold. Royalties

can be paid as a percentage of sales revenues, a percentage of the wholesale selling price, or a fixed amount per unit.

As you can see, licensing a product has a lot of advantages. You get a continuing revenue stream, you still own the intellectual property rights (and can, therefore, incorporate your technology into new products, which you can sell direct to customers, license to your current licensee, or even license to another company).

The primary disadvantage to licensing is that you get a small sum of money up front. If the product does not sell well (either because your product is targeted at the wrong market or because the licensee does not invest enough money in marketing to generate sales), you will end up with few rewards for all your hard work. Another disadvantage is that if your product is very successful, the licensee might grow tired of paying the royalties and develop their own product to compete with yours. And if the licensee sells two similar products, one of which requires royalty payments and one of which doesn't, you can guess which product is going to get pushed the hardest by their marketing department and sales staff.

(As an interesting side note, most government and university technology transfer programs license their technology only and allow the licensees to build the technology into commercially viable products. Straight out of the research labs, the technology is usually not very useful. If you license a technology through a technology transfer program, you will probably need to spend a lot of time and money commercializing it. Even so, these research labs can be a great source of new ideas and products. Be aware that the restrictive licensing agreements, initial payments, and royalties can make these technologies prohibitively expensive, but they can certainly be worth pursuing, even for small entrepreneurs.)

Finding a Partner, Buyer, or Licensee

If you wish to partner with another company or sell or license your product, choosing the right company is absolutely critical. (For simplicity of discussion, we will refer to the company with which you will be working as your partner, regardless of the exact arrangement you are pursuing.) There are four steps in the selection process:

1. Build a list of prospective partners.
2. Qualify the prospective partners.
3. Evaluate the qualified partners.
4. Negotiate and close the deal.

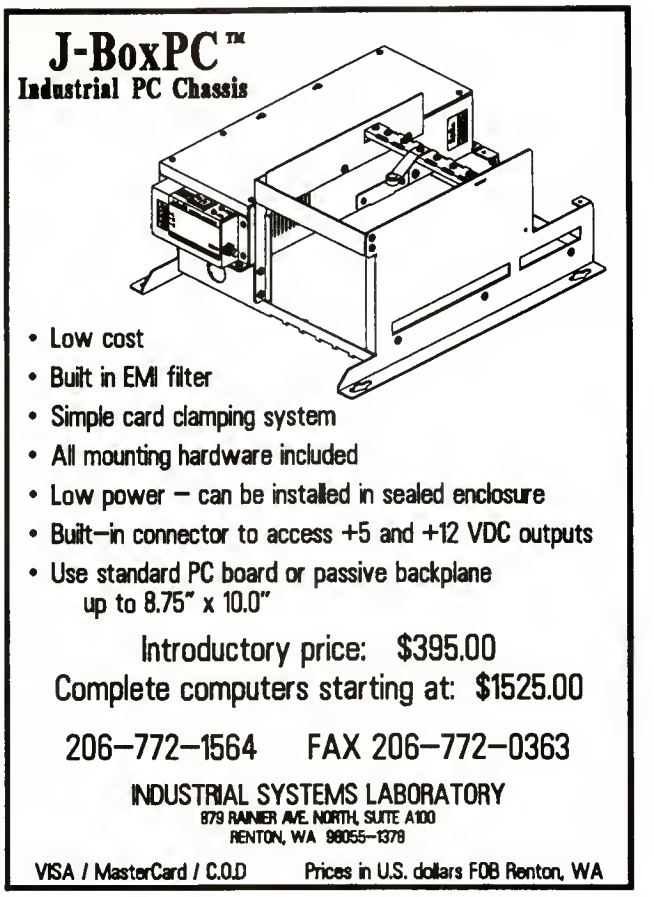
We will look at each of these steps in turn.

Build a List of Potential Partners

Where do you find companies that might be interested in becoming your partner? Although good partners can be found in many ways, some of them quite unlikely, here are some good places to look for potential partners....

1. Competitors

Would your competitor like to put you out of business? Or incorporate the best features of your product into their products? If so, they might be good partners. (If the competition between your products has been confrontational, mean-spirited, or hostile, it may be difficult to find someone in the



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company who is willing to listen to your proposal. It may also be hard for the company, if they have been attacking your product in their ads, to reverse direction and begin telling the market that your products are wonderful. If the only difference is that they are now selling or publishing your product, they will have a hard time maintaining their credibility in the market.)

2. Producers of Complementary Products

Does your product work especially well when used in conjunction with someone else's product? If so, that company may be a good prospective partner.

3. Companies Upon Whose Products You Rely

Look at your bookshelf, desk, or workbench. Upon whose products do you rely for your work? Manufacturers of logic analyzers, test equipment, compilers, and reference books may all be good potential partners. After all, if you rely on them in your daily work, there are probably many others who do as well.

4. Catalog Publishers

If you've been involved in your industry for any length of time, your name has probably found its way onto a lot of mailing lists. Look at the catalogs you get in the mail. Do they carry products similar to yours? Do they carry products targeted at the same market at which your product is targeted? The catalog publisher might be a good potential partner and the companies whose products appear in the catalogs might also be good potential partners.

As you build your list of prospective partners, you should not exclude any companies. Add as many companies as possible to your list. The more companies you can add to your list at this stage, the more options you will have later in this process. If a company is in the same (or a related) industry as you, add them to the list, even if they do not, at first glance, seem to be a very good fit for your product. Try not to eliminate possibilities at this stage; we'll do that in step two in the second installment.

ME

Alan C. Earnshaw is the President of Information Management Systems, Inc., a five and a half year old software publisher in Orem, Utah. His company has developed two products in-house, acquired the complete rights to one product, and licensed 11 other products from four individual programmers and one company. If you have any comments on this article or are looking for a publisher for your software or software-related product, Alan would like to talk to you. He can be reached by phone at (801) 226-6390, by fax at (801) 226-6291, by e-mail at alan@infoms.com, or by mail at 1165 N. Industrial Park Dr., Orem, UT 84057-2807.

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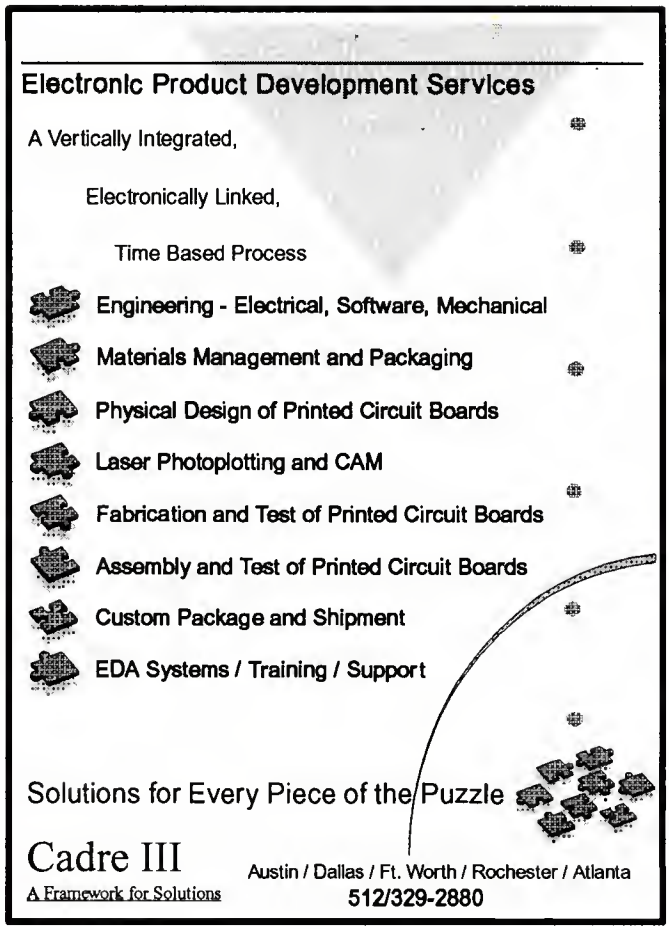

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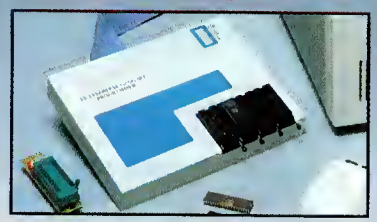

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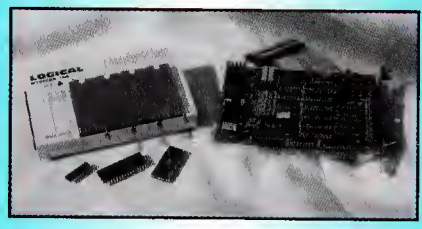

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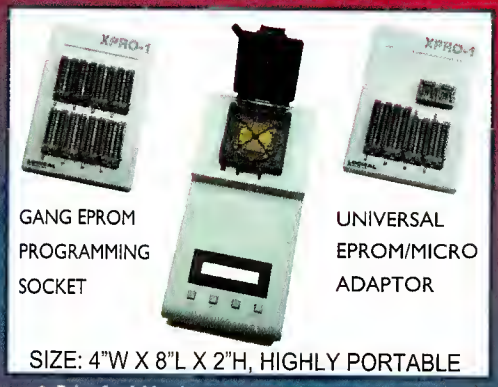

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Mystery band amplifiers, especially low noise ones, do remain a big problem.

There's two brand new mystery band power generation schemes. In one, you build up an array of black antennas. Then, you whap the array with a laser. The incoming light photons get absorbed by the black, and their energy gets re-radiated in your desired mystery band frequency. See *Science* for June 25, 1995 for details.

The other is called the *accordian method*. In which you generate some microwaves in a plasma and then literally squash the plasma by blasting one end of it with a laser. The radiation upconverts by being squashed together. Sort of the exact opposite of the *Doppler Effect*. Details again in *Science*. This time in the March 24, 1995 issue.

Newly emerging mystery band apps include imaging of integrated circuits and biologicals. Two papers to get you started: *Terahertz pulses create diffraction-limited images*. In *Laser Focus World* for July 95, pages 15-19. And *THz waves see through objects* in *E.E. Times* for June 12, 1995.

Your best traditional source for mystery band info is the obscure and pricey *International Journal of Infrared and Millimeter Waves*. The *Radio Observer* from the *Society of Amateur Radio Astronomers* is also handy.

Mystery band fundamentals appear in HACK84.PDF, with further details in MUSE92.PDF. For high frequency resources in general, try NUTS26.PDF.

PIC Microcontrollers

The word should be out by now. The PIC is *the* micro of the decade. It completly blows the competition away on all counts. Utterly and totally. Owing partially to its 3X speed and 3X code length advantages. But mostly to its elegant simplicity, its off-the-shelf allocation-free availability, and its incredibly clean architecture.

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Let's see. Start with the bingo card and the *Microchip Technology*, *Parallax*, *Transdata*, *Micro Engineering Labs*, and similar ads you're likely to find scattered around this issue of *Midnight Engineering*.

Then, get the *Microchip Data Book* and *Microcontroller Applications Manual* from *Microchip Technology*. Next, pick up the *BASIC Stamp* from *Parallax*, and the *PIC Tools* from *Scott Edwards Electronics*.

Circuit Cellar is now big on PIC aps. Projects also now appear in *Electronics Now* and *Nuts & Volts*.

Speaking of which, Scott Edwards also runs a great series of PIC columns in *Nuts & Volts*.

I've got all of these up on *GEnie* PSRT, along with the full set of *BASIC Stamp* application notes.

I've also got scads of my own PIC stuff in the PSRT library. See HACK87.PDF for some PIC resource listings, MUSE88.PDF for PIC fundamentals, and MUSE94.PDF for a *Basic Stamp II* introduction.

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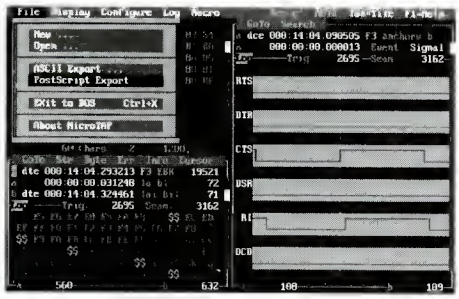

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There are vastly more magic sinewaves than there are particles in the universe. Sadly, an exhaustive search or random grab won't hack it. The trick has been developing specialized, efficient, and effective tools to filter out the handful of useful ones. Today, magic sinewaves represent a billion dollar opportunity.

I've got a free reprint on magic sinewaves for you if you call or write me here at *Synergetics*. Formal proposals and tutorial packages on consulting, seminars, source code, working chips, and co-developer programs are also offered to serious inquirers.

The reprint is also available as MAGSINT.PDF. There are hundreds of additional magic sinewave files provided in the *GEnie* PSRT library.

Solitons

Much of communication gets done by sending a pulse into a media and hoping part of it comes out some distance away at the other end. Three effects conspire to limit how far you can send a pulse: *Reflection* off lumps in the media, *Dispersion* in which the waveshape degrades over distance, and *Dissipation* where any frictional losses in the media convert the pulse energy into low grade heat.

Dispersion is often caused by certain pulse frequencies traveling faster than others. The net result is a flattening of the pulse. Limiting its detectable height and widening its measurable resolution.

By carefully selecting a suitable *nonlinear* media and then exactly controlling a pulse waveshape, a special pulse known as a *soliton* can result. Short for *solitary wave*. The nonlinear media slows down the *highest amplitude* portions of the wave, *exactly compensating* for its dispersion. The pulse goes on and on without changing its shape. Only the dissipation and reflections ultimately do it in.

Soliton pulses can easily be sent around the world on an optic fiber. They also work well on canals and on tramway cables. The big deal is that you can send signals further and faster. Starting with lower power and using fewer repeaters spaced further apart along the way.

You'll find some 8300+ Soliton references on *Dialog*. Start with Russell Herman's *Solitary Waves* in the July 1992 issue of *American Scientist*.

I've got a soliton tutorial and key paper list up for you as HACK77.PDF.

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DNA Computing

The human genetic code represents the ultimate hack. As you might suspect, folks are scrambling fast and furious here. The genome map itself seems the current big bucks biggie. The December 22, 1995 issue of *Science* has full secret insider details on their latest 15,000 landmark map. On pages 1919 and 1945-1954.

An alternate take on DNA possibilities appears in *Wired* for July 1995 on pages 120-124.

DNA is neat stuff. Besides building your own custom rhinopotamus, the glop makes a great chemistry kit. Seems there are four different molecules you can string together (A,C,G, and T) into arbitrarily long digital words. You can then *simultaneously* work with these words in *billions* of parallel processes. At costs and energy levels that make a Pentium an outright joke.

Ferinstance, a calculation that's related to the traveling salesman problem gets done a thousand times faster than the best supercomputer. Again in *Science*. November 11, 1994 this time, pages 993 and 1021-1023. Also see the follow up in *Science* for April 28, 1995. Where you'll find computers that far exceed human brain capacity.

Or, heading off in a different direction: Until recently, DNA was thought to consist of 96 percent useless "junk" and only 4 percent "good" DNA. Now, it turns out that a language – any language – has this remarkable property: Oversimplifying, the fifth most popular word gets used one-fifth as much as the most popular word. The hundredth most popular word gets used 1/100 as often. No matter whether its *Cobol* or *Swahili*.

Guess what? "Junk DNA" statistics *exactly* obey the *same* rules as *all* known human and computer languages! And the "good DNA" instead seems to obey the same rules as does efficiently compressed data! Details in *Science* for November 24, 1994.

If you want to make a real quick buck on this, just publish the pocket reference card for the DNA language.

Show us how to access a utility subroutine or two.

There's several emerging alternates to DNA computing. See *Secrets of Quantum Computing* in *Scientific American* for October 1995. And especially *Science* for September 8, 1995 on pages 1363-1364. Also see the summaries shown in MUSE95.PDF and MUSE96.PDF.

Binary Chain Codes

Binary chain codes are another group of repeating binary sequences. Chain codes have a remarkable property: *They are self-positioning*. Any short sample can tell you exactly where you are in the entire series.

The most obvious use for any binary chain code is in a rotary position encoder. Compared to the usual *Gray Code* position encoders, the binary chain encoder is simpler and cheaper and allows much sloppier tolerances.

Other possible uses include self-organizing geographical data bases. Topo maps, anyone?

Photocraft is one source of ready-to-go binary chain code encoders. I have posted a chain code intro up as my HACK80.PDF. Additional technical details appear as BINCHAIN.TXT and MORCHAIN.TXT. ✦

Microcomputer pioneer and guru Don Lancaster is the author of 33 books and countless articles. Don maintains a US technical helpline you'll find at (520) 428-4073, besides offering all his own books, reprints and various services.

Don has a free new catalog crammed full of his latest insider secrets waiting for you. The best calling times are 8-5 weekdays, Mountain Standard Time.

Don is also the sysop of GEnie PSRT where a special area has been set aside for all you Midnight Engineering readers. For modem access, dial (800) 638-8369. When prompted, enter JOINGENIE. When asked for a keyword, enter DMD524. Or you can also reach Don at Synergetics, Box 809, Thatcher, AZ 85552.

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Don't Intimidate Yourself

by Jack Krupansky

Despite all the external factors which influence success, I've found internal factors to be a bigger impediment to success. As troublesome as competition and the market can be, they are only as much trouble as you let them be. It is your approach to these challenges that makes the difference. Too many times I have been talking with someone and one of us laments the unfairness of the success of Microsoft, Borland, Apple, etc. One of us says "I could have done that" or "I could have done that better." But we didn't. Nobody stopped us, we stopped ourselves. We intimidated ourselves into leaving markets to others.

As troublesome as competition and the market can be, they are only as much trouble as you let them be.

I can look back at a number of times when opportunities existed that I did not fully exploit. There was always a long list of "good" reasons for staying out of the market, going slow, or just not focusing intensely enough to develop a killer product. There were the first personal computers, the Apple II, the IBM PC, the Macintosh, Windows, Windows NT, Windows 95, the Internet/Web, objects, virtual reality, multimedia games, and more.

The "good" reasons for not moving forward more aggressively usually make lots of sense from a purely technical or abstract point of view. But unless tempered by a healthy dose of entrepreneurial energy it is far too easy to get bogged down in details. Here are a few of my "favorite" reasons for demotivating myself and failing to exploit opportunities.

I Might Be Wrong

Whether your ideas are wrong or not is no excuse for holding back. Reality will be a better judge than your internal fears. The logic of your concerns may be flawed and your worst fears may be insignificant. Besides, even if you are wrong it may still be possible to make some corrections and turn around and succeed anyway.

Finding Out I'm Wrong

Or maybe your fears are right and you are confronted by real problems. Even that shouldn't stop us. Sometimes we are so consumed with the details under our control that we have little time, energy, or patience to give proper attention to new issues that pop up. That lack of reserve energy results in a knee-jerk response that rarely reflects our true capabilities. So we need a contingency plan for dealing with unforeseen problems. You need to give yourself a little room to carefully consider the new issue and give it a thoughtful response. You rarely need to drop everything for every new problem that crops up.

Once you've made a commitment to a project you have a strong incentive to solve problems. But when a project is still at the idea stage it is very easy to end up dropping it rather than work through the problems.

Knowing My Idea Has Problems

Any complex idea will have lots of difficulties to resolve. While you want to be express confidence in being able to solve all the issues you also need to have a "feel" for how nasty the issues are. It's too easy to get very depressed by the sum of the problems and either go slower or maybe even abandon an idea.

Insurmountable Problems

Sometimes you look at the issues and "decide" the situation really is hopeless. It may be tempting to give up, but this is when a real entrepreneur earns their keep. A different angle of attack might allow you to see more clearly how to surmount the obstacle. Or maybe there are a few chinks or crevices in the "wall" that you can exploit.

It Seems Too Hard

At first glance a problem may seem insoluble, but on closer inspection we can begin to see opportunities to exploit. If a problem seems too hard, that usually means I'm just not (yet) really motivated to take it on.

Lack of Knowledge

The unknown can be very intimidating, especially for techies that thrive on detail and planning. You're not sure exactly which direction to go, what angle to approach from, or how fast to move in. Fear of the unknown is quite natural, but it must be overcome. A good entrepreneur thrives on the unknown and exploits it fully. They move in rapidly when others move too cautiously.

Too Much Knowledge

If your analytic abilities are really good you can see all sorts of problems that your rational mind will tell you to worry about. Less able competitors will either not see all the problems, not rate them as severely, or decide to ignore them. For

the entrepreneur, it's not what you see but how you deal with it. An engineer will prefer a slow approach around the potholes while the entrepreneur goes straight on and not only gets further faster, but thrills from the bumpy ride.

Someone Else Must Already be Doing It

I don't know how many times I have been discussing some idea with someone and one of us says that it is so obvious that someone must be doing it. We're sometimes right, but not always. It's senseless to so cavalierly eliminate opportunities. Someone else may have started attacking a market, but will they succeed or will they finish before you? Too many indeterminate questions. So don't use this as a filter for your ideas.

Lack of Moral Support

It may seem desirable to have all your friends, associates, and loved ones giving you great encouragement and it's easy to get discouraged if you don't have that support. They may give your venture lip service or may tell you outright that you're doomed to failure and must be crazy to think you have any chance. But you should do what you need to do regardless of the level of external support. The only external support you really need is the long-term support of the market. And you will get tons of support when you start becoming successful. You should also be wary of overly enthusiastic support that focuses on perceptions of what your success might eventually be rather than on a realistic assessment of the market reality.

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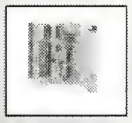
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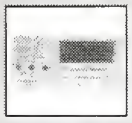
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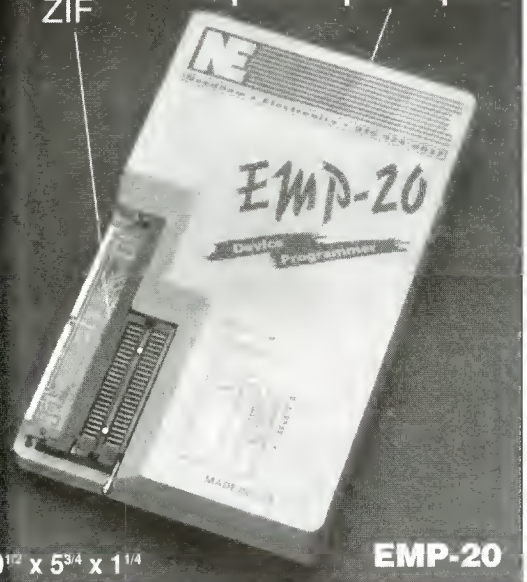

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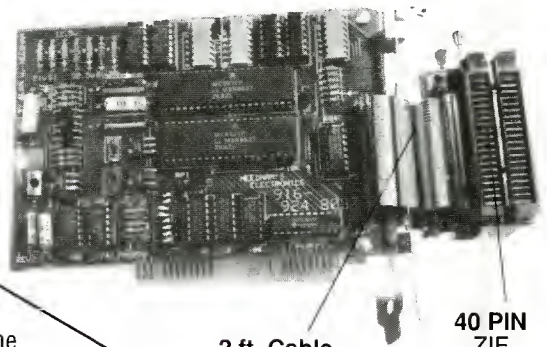
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Reader Service Number 95

Lack of a Team

When you're working as part of a good team you know you can depend on others to do their part and even help you out when you need it. And when something goes wrong there is always someone else who could be blamed. When you're on your own you don't have any of that. But I never worked on any ideal teams and was always frustrated by "team" members not doing their jobs (which I then had to cover for) and their rarely being able to help me out. Now I revel in my independence and total acceptance of absolute responsibility. But when I look at a new market opportunity I frequently find myself saying that a "real" team would be needed to pull it off.

Too Much for Me to do Alone

A good engineer looks at a problem and tries to discover all the possible issues that will need to be resolved to solve the problem. But that presumes a clear problem statement as a starting point. It may be that only a small subset of the problem need be attacked, at least initially. It is the role of the entrepreneur to whittle down the problem to a manageable size and phase it so that it can be attacked by the smallest possible team (preferably a single person).

Lack of a Ready Market

It's nice to have a well-defined list of potential customers and even some commitments to buy before you start developing your product, but don't let a lack of that stop you. Use your gut feel. Ask yourself hard questions and run your ideas against the cynics and naysayers to make sure that you feel strongly about your ideas in the face of criticism. Then go for it. Be prepared for total failure. Be prepared to change your plans on a moment's notice. But don't insist that your success be guaranteed before setting off on your venture.

Market Research

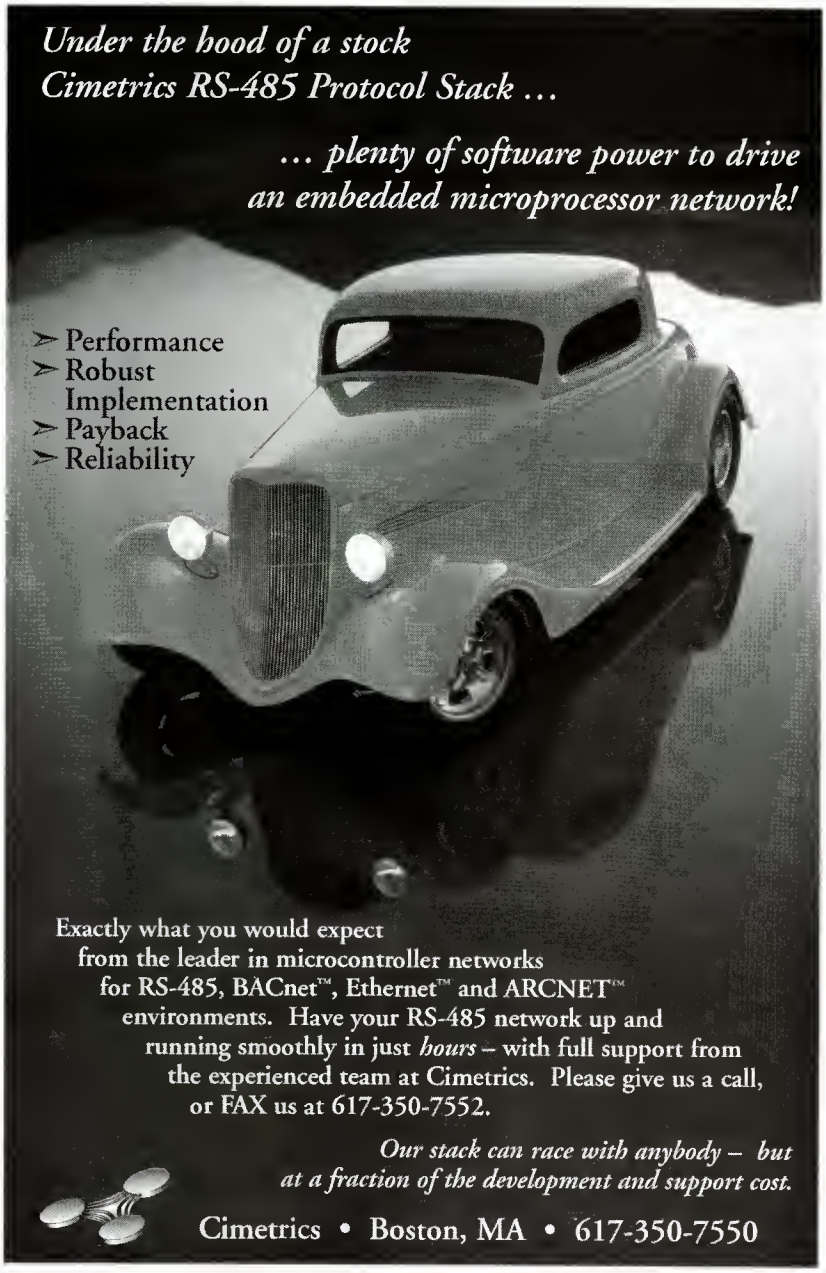
A thick market study can give you a false sense of confidence or falsely destroy your confidence. The study may be flawed, incomplete, outdated, or maybe just not relevant to your ultimate market. It may overestimate the threat to your venture. And it may underestimate potential threats that could wipe you out. Use any studies as raw, input and make your own gut-feel judgments.

Lack of Market Research

You can feel pretty intimidated by not having a formal market study to lean on. Don't let that slow you down. Do some reading and talk to some people. Then use your entrepreneurial, gut-feel to make a judgment which will probably serve you as well as a thick study.

Lack of a Fancy Business Plan

A big, thick, bound business plan may "look" impressive, but a simple one-page summary can have more real substance and stand a better chance of surviving an evolving and competitive market. The thickness of the big plan may be devoted more to explaining a weak strategy than to defining the few key elements that will make a successful plan work.



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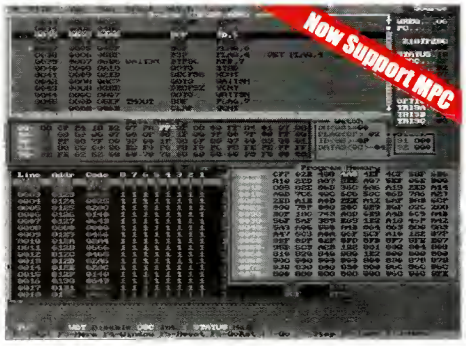

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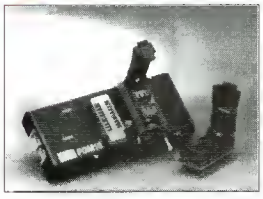

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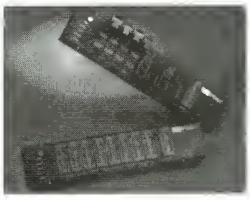

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Reader Service Number 133

What the Competition Says

You hear or read something from a competitor and it sounds ominous. But don't act on it too quickly. Your interpretation of what they say may be radically different from reality. They may be shading the truth. They may be talking about future plans (aka vaporware) rather than what's shipping. And it might just be an outright lie (sometimes called misinformation). More commonly it may just be a claim from someone who doesn't really understand what they're talking about and who doesn't understand the problems with their claims. It is also very easy to misinterpret any marketing claim. If you fear the worst, you start seeing the worst in everything. What initially sounds like an insurmountable mountain may really be no more than an easily climbed hill or possibly even a diversionary tactic.

Things You Read

It's very easy to terribly frighten yourself by reading something in a trade publication. Writers and columnists usually are much less knowledgeable than you. They may have more immediate access to trade gossip, but that's not a good basis for business decisions. Don't get all worked up and worried by what you read. Treat it as input with a low signal to noise ratio. Filter it carefully and heavily. The facts may be wrong, they may be misrepresented, or you may be reading too much between the lines. Like a good reporter, you should always check the facts even if they were written by someone who should've already checked them. Their criteria for validity is probably much lower than your needs. More Stumbling blocks in part 2.

ME

Jack Krupansky runs a one person software business, Base Technology, which develops and markets the Liana object-oriented programming language and C-odeScript scripting language interpreter and offers Windows software development consulting. He may be reached at 212-626- 6630, Fax at 212-626-6632, e-mail at 70642,2662 on CompuServe, or snail-mail at 1120 Avenue of the Americas, 4th Floor, New York, NY 10036.

Free Chip Design Info

by Jason McDonald

Integrated circuits are the heart of most electronic design projects, and most IC manufacturers stand ready with a barrage of free information — databooks, application notes, development tool handbooks, etc. — to help you design "their" chip into your design. Most have toll-free literature distribution numbers, some have automated fax-back systems, and many now offer extensive World Wide Web servers. Yet despite this outpouring of money and resources, identifying FREE information in the labyrinth of toll-free numbers, fax-backs, and Web sites is a daunting task.

In this article, I proceed company-by-company among the major semiconductor manufacturers and a few excellent Internet sites. It's derived from my personal "cheat sheet" of free information available from each company. First you must know the lingo. Literature distribution is the subdivision whose task it is to send you free information. Faxback is an automated system in which you dial up, key in codes, and then the system faxes you free information. World Wide Web (WWW) is the Internet equivalent, by which you log on to http://www.intel.com, browse and obtain information. In some cases, you must have the Adobe Acrobat reader obtainable from Adobe for free at http://www.adobe.com.

First in the alphabet, ***Advanced Micro Devices*** is the manufacturer of flash memory, 29K, and numerous x86 chips. Literature distribution is at Tel. 800-222-9323. To get started, request item 19542B which is the 1995 Product Catalog. A few excellent items are: Programming the 29K Family (19243B), the PCMCIA Training Manual (17515B), and the FusionE86 development tools catalog (19255A). AMDs fax-back is at 800-222-9323, option No. 2. Follow the instructions to obtain a catalog of available literature such as that on AMD Microcontrollers. Web address is http://www.amd.com.

Dallas Semiconductor, maker of 8051-type chips, can be reached at Tel. 214-450-0448 to request free literature. Dallas faxback number is 214-450-0441, and their Web site is at http://www.dalsemi.com. Dallas also sends information by email, sales@dalsemi.com.

Digital Equipment Corporation, manufacturer of DEC-Alpha, has an extensive Web site at http://www.digital.com.

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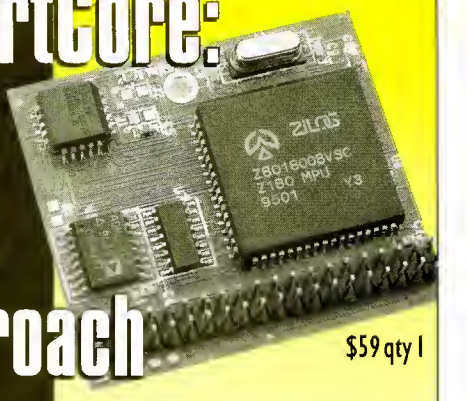

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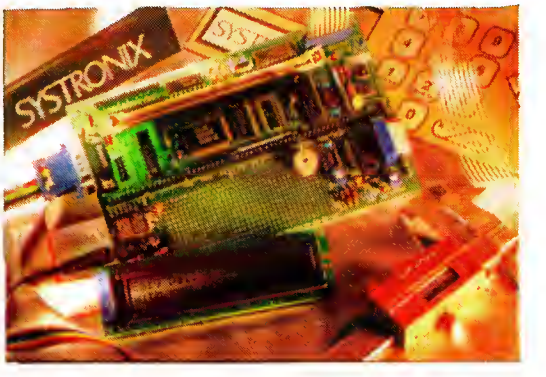

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DEC has made a major commitment to the Internet, and put their Master Product Catalog at http://www.digital.com/info/master-subject.html and added a search engine to the Web site. Literature distribution is at Tel. 800-332-2717, and faxback is 800-723-4431.

Fujitsu Microelectronics is part of the Sparc consortium and provides the free catalog, The 930 Series: The Complete Third Party Solutions Guide. Call Fujitsu literature distribution at Tel. 800-642-7616 and request it by title. Also request their 1995 Master Product Selection Guide. Fujitsu is on the Web at http://www.fmi.fujitsu.com/index.html. More Sparc information is available directly from SPARC at http://www.sparc.com whose literature distribution is Tel. 415-321-8692 x221.

Harris Semiconductor, manufacturer of x86 and DSP products, can be reached at Tel. 800-442-7747 for free literature. Faxback is Tel. 407-724-7800. Harris is on the Internet at http://www.semi.harris.com and don't miss the Harris Institute which provides basic semiconductor information at http://www.semi.harris.com/harris_web_sites/harris_institute.html (an example might be a lexicon). The Harris Web site is also searchable.

Hitachi Semiconductor produces the SH and H8 chips which have made a strong design showing in recent years. They just launched their Web site at http://www.halsp.hitachi.com/ and you can also request product datasheets at Tel. 800-285-1601. Hitachi has a new development tools catalog available, too.

IBM Semiconductor Division provides a nifty overview to PowerPC development tools called the PowerPC Embedded Tools handbook (MPREM4UMU-01). There is a new edition, its free, and you can get it by calling Tel. 800-769-3772. IBM is on the Web at http://www.ibm.com but don't get lost in the labyrinth — IBM Semiconductor is at http://www.chips.ibm.com.

Integrated Device Technology (IDT) is on the Web at http://www.idt.com and offers a RISC hotline at Tel. 800-345-7015. Better still, IDT will send you a free CD-ROM of their datasheets, product info, and application notes. Request the CD-ROM as CD-CORP-00105. You must install Adobe Acrobat to view the information (included on the CD-ROM).

Intel publishes a wonderful overview of free chip literature (including flash) called The Embedded Products Source Book. Call Intel literature distribution at Tel. 800-548-4725 and request item 272676-001. The Solutions i960 Catalog overviews the i960 architecture and development tools (270791), Intel's ApBuilder (an Intel-sponsored development tool) has a great fact sheet (272198), the Fuzzy Logic Applications Handbook is item 272589, and Intel's application brief on Low Voltage Design is item 272324. For each architecture, Intel produces both product line cards and development tool handbooks. All are cross-referenced in the Source Book. Intel's faxback is 800-525-3019, and Intel's WWW is http://www.intel.com.

The Internet itself offers a few excellent design resources. ***The Chip Directory*** at http://www.xs4all.nl/~ganswijk/chipdir is a searchable index of chips organized by design type. Univ. of Wisconsin's computer architecture page has links to all sorts of Web resources at http://www.cs.wisc.edu/~arch/www/. Microcontroller/Microprocessor index at http://www.cera2.com/micro.htm is an overview to IC resources on the Net as is the CPU Information Center at http://infopad.eecs.berkeley.edu/CIC/.

Microchip is on the Web at http://www.ultranet.com/biz/mchip/ and can be reached at Tel. 602-786-7200. Email to request literature is literature@microchip.com. ***Mips Technologies*** has a beautiful Egyptian-style Web page at http://www.mips.com. Turn your graphics off and youll find a wealth of Mips information behind the Egyptians! Mips faxback is 800-446-6477, and telephone is 800-998-6477.

Motorola is a labyrinth unto itself. Literature distribution is at Tel. 800-441-2447 but don't call unless you have a document number. There's no cross-referencing! Save yourself hours by obtaining Motorolas Master Selection Guide (SG73/D). Some highlights of free information: M68000FR/AD (M68000 Family Reference), BR729/D (68K Coldfire Source Guide), DSP56100FM/AD (DSP Family Manual), POWERPCDIR/D (PowerPC Source Guide), and MCUDEVTLDIR/D (Development Tools Directory for M68HC05, 08, 11, 16, M68300, and MPC500 families).

Motorola faxback is Tel. 602-244-6609. It is not easy. Request Doc. #1 to get started. Then, obtain a PIN (Personal Identification Number). Once you have a PIN, you must enter either the document number of the part number from a Motorola databook or the Motorola Master Selection guide. For example, MC143150/D (LonWorks Neuron IC Datasheet) is a series of numbers beginning with 61 for "M."

Motorola's Web information is also confusing. AESOP (in charge of the 68K, Coldfire, and Embedded PowerPC) is at http://pirs.aus.sps.mot.com/aesop/aesop.html. Microcontroller group is at http://freeware.aus.sps.mot.com/index.html and has links to both the AMCU (M68HC11, 16, M6833(x), and MPC500) and CSIC (M6805, M68HC05, M68HC08) groups. Semiconductor Products Sector is at http://motserv.indirect.com/ (which offers a Web faxback service) , and the main web page is at http://www.motorola.com but don't start there.

National Semiconductor can be reached at Tel. 800-272-9959, or on the Web at http://www.natsemi.com. NEC Electronics is at Tel. 800-366-9782, and Web http://www.nec.com. ***NexGEN*** (soon to merge with AMD) is at 800-863-9436, on the Web at http://www.nexgen.com/. ***Oki Semiconductor*** is at http://www.okisemi.com and at Tel. 800-654-6994. ***SGS-Thomson*** is at http://www.inmos.co.uk/ with a faxback of Tel. 214-466-7788. ***Siemens Semiconductor Group*** is at http://www.siemens.de/Semiconductor/index.html.

Philips provides a great overview to the 8051 architecture, its Application Notes and Development Tools for 80C51 Microcontrollers (9397 750 00013). Philips has also published a wealth of information on their new XA architecture, including a tools handbook. XA databook is item 9397 750 00219. Call 800-447-1500 for Philips literature distribution. Philips faxback is 800-282-2000, and Philips Web is at http://www.semiconductors.philips.com/ps/.

Texas Instruments is on the Web at http://www.ti.com with their DSP division at http://www.ti.com/sc/docs/dsps/dsphome.htm. Texas Instru-

ments publishes an excellent guide to their DSP products and Third-Party Vendors, the TMS320 Third-Party Support guide (SPRU052B). Literature distribution is Tel. 214-644-5580 but helpful ONLY if you know the literature number. Request item SSYC005B, which is the Master Product Selection Guide for TI Semiconductor Products. Otherwise call the Customer Response Center at Tel. 800-336-5236 which can cross-reference documents and numbers.

Western Design Center, maker of W65C02C and W65C816C, is at Tel. 602-962-4545, Email. wdesignc@indirect.com ***Zilog*** literature distribution is Tel. 408-370-8016 but their Web site offers better access to information on the Z8, Z80, and Z180 at http://www.zilog.com/. If you have only email try info@zilog.com.

ME

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6801/03	650.00	250.00	150.00	250.00
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RFPC—9.1

Again this issue, I ended up with about 5,000 copies of a section of the magazine without really getting the quality I wanted. That leaves me in the same position that I was in last issue: The press runs and I can put ink on paper, but the paper doesn't track straight.

So, we'll just stay stuck at RFPC—9.x until I get past this hurdle. It seems like the printing press, after I keep leveling it, just makes the floor sink further. A portion of the press is over a basement, so this is understandable, but the bulk of the 100-foot long press is on concrete slabs that apparently aren't able to support the weight.

Art Andrew called about ENTCON '96 and we got to talking about the printing press. Ends up he has done a considerable amount of structural engineering. He thinks that I may be getting close to point where the structural aspects of the floor — especially over the basement — are about to give way. The floor would support the weight, but if I continue to crank up the units with the leveling screws, eventually the floor gives way.

Right now some of the floor plates under the press units are bent as much as 1/2". These are 1" thick cold-rolled steel plates.

The trick is to take the load off of the leveling screws and then place shims under the plates where there is solid concrete flooring. In the basement, I need to support the ceiling with additonal posts and beams. All told, there is about 15 tons of weight sitting on top of that basement ceiling.

So, this issue is printed in Denver again at Publication Printers. I will try to print the insert card on the web press for this issue. In the past, I have printed those cards on the small sheetfed press and it takes all day. On the web, the cards will print in less than an hour. If I succeed, you will see a "web" next to the "Printed by RFPC" that usually appears on the card.

There seems to be a lid on my progress in printing this magazine, but that only means that there is need for a new approach. I have revisited all my assumptions and am finding some to be invalid. For example, there is a paper packing under the rubber blankets on the impression cylinders that were .010" when I got the press. I just kept it the same. Now that I understand more, I find that this created at .014" squeeze on the paper going through the press — it should be more like .004". Things like this can add up.

WEG

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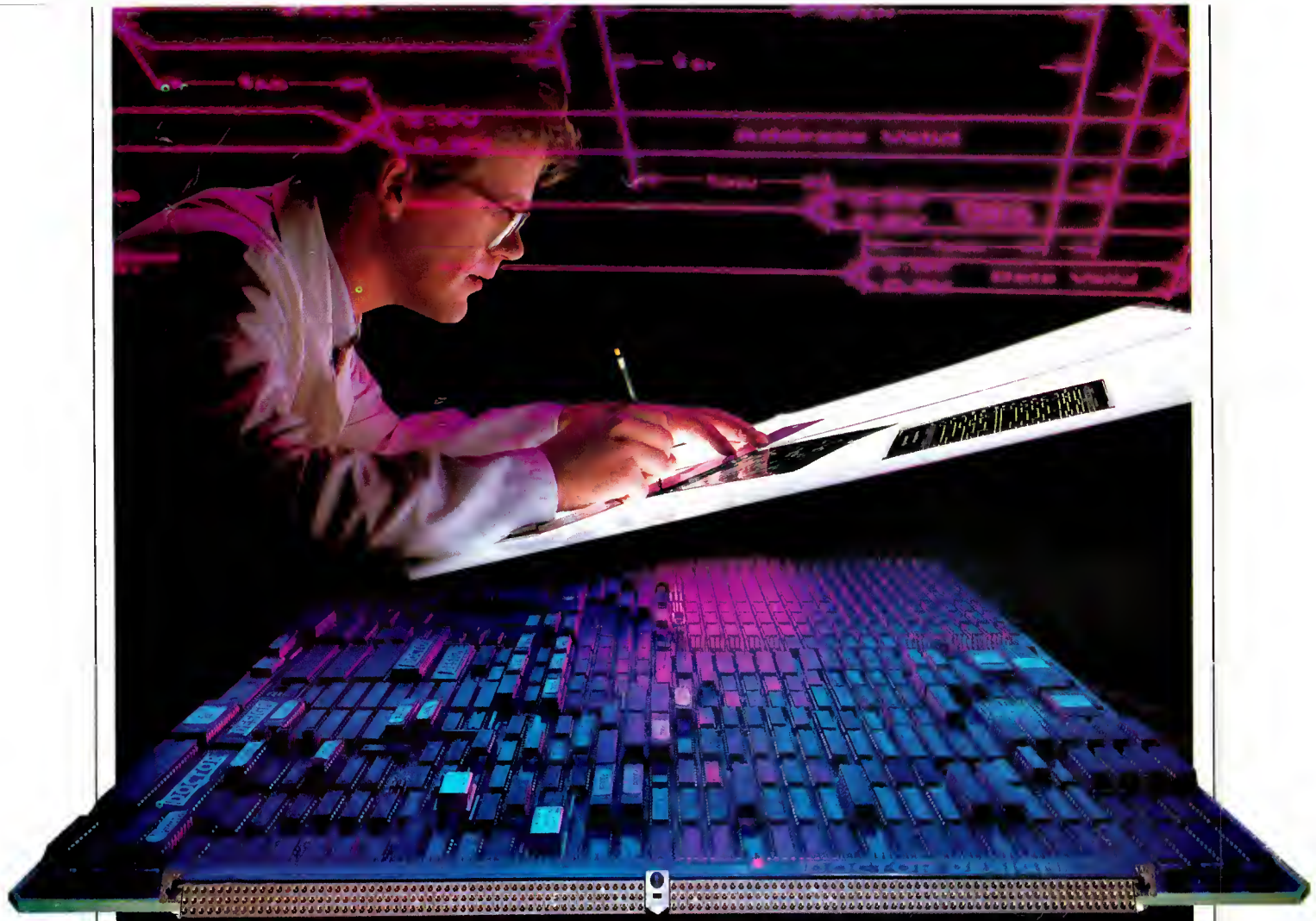

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continued from page 8

sion would make the whole boatload technically obsolete before it could be liquidated.

But, back to Bill Gates. In his book, we get some firsthand insight into the mind of this bright fellow. I really do admire him — he gets my vote for entrepreneur of the decade (1980s). I can't give him my vote for entrepreneur of the century because Henry Ford still outclasses Bill (more ruthless and more understanding of scale). Bill does make some good points in his book. It's just that he doesn't have the breadth or depth of experience to go off predicting the future on the broad scale that he does. He wants, like most people, for the internet to be the answer to a host of problems and desires. Bill talks of people changing as if he doesn't understand the nature of man. He then couples this with a call for upgrades of hardware and software in education so that we can finally do real pretty and pleasing audio/visual instruction. Learning is hard work and the harder the student works at it the more learning that occurs. A good book, a quiet place, and good lighting is all that is required.

Technical Razzle-Dazzle

For the last five years, the technical world has not quite been able to figure out what it wants out of a list of what it can't have — at least not right away. CD-ROMs and Multimedia got consumers fired up, but most of those notions are abating now, since we really need about 10x CD-ROMs and to re-buy accelerated video boards. At the consumer level they don't like to re-buy appliances like us nerdy types. If it's a toaster, it should make toast when it's plugged in — not just give the aroma of toast and the promise of the real thing when and if the technology improves.

Then, of course there was OOP. I've watched too many programmers re-code too many functions their own way to believe that reuseable code will blossom into software ICs. If hardware engineers could sit down and make their own chips quickly, cheaply, and easily, there wouldn't be near the handsome array of standardized hardware components that we have today.

Then we had the industry surety of the PDA. If I want an assistant I should hire one, because there is nothing worse than a simulated one that can't read my writing. For the last few years, there has been this tendency in the industry to think of the unfolding of technology as a narrow path. We identify PDAs or OOP or Visual Programming or the Internet/WWW and everyone rushes to put out "something" in the new area. That is very abnormal and we are watching nothing less than a growing disillusion among PC users relating to artificial, revenue-driven, release cycles with built-in incompatibilities. There comes a time when the bulk of the users just don't upgrade — we are seeing more of it everyday.

For the most part, Bill is trying to define a future for himself and Microsoft. I know it's hard to imagine, but I think he is really trapped in this guru/visionary role that is not an enduring profession. You see, it can be (and has been) very beneficial for him to be narrowly focussed on Windows and the PC world. He could just keep pushing on windows until version 3.0 when he finally got some convergence between his vision and reality. But that's not the way the world works over the long haul. If you keep betting the company, sooner or later there will be a series of wrong decisions and then external factors will gang up and ...well, just watch Intel, with their suicide investment strategy of spending more $billions on each microprocessor at increasing risk. One of these days their entire equity will disapear in one CPU market cycle.

I was struck by the pacing and repetitious nature of the book. It reads in cycles. The reader gets a dose of some of Bill's recollections (and we do get to know the man a little better from them), then some references to Microsoft products and strategies, then some future-talk (showing how nicely Microsoft fits into it), and then start all over with some more recollections. Every once in a while, we get to learn some about his house. This is a formula book, but still it's interesting because of who he is and because it's high tech. We techies just don't get much in the way of high tech stories. Of course, you and I know about all the technology Bill talks about, we are reading it to get his vision of the future.

Seriously though, I think this book — because it is so readable and topical — will be surprisingly beneficial to many who buy it simply because of the interesting historical perspective on computing technology. With an incredibly broad brush, Bill has covered just about everything you would think that he thinks about. The trouble is that he doesn't really identify with the reader and life away from the screen/keyboard/mouse. It seems to me that Bill feels he must follow every possible thread into the future, even though he has no relevant experience in some areas.

His ideas about information and computer technology in education and the raising of children is hopelessly insular — perhaps in 5 or 10 years and 2 or 3 children Bill will understand what the rest of us are finding out: Children get the strong, classical education they need, not from computers and information systems, but from strict instruction and serious study. This is not happening in public education today and tons of money has already been thrown at the schools for computers and educational software (mostly games). Far from being the help that Bill envisions, these students consistently see the computer lab as play time at the expense of serious study. Many of us have had to resort to home schooling in order to get anywhere near the quality of education we received in our youth — the reader should check the standardized test scores, they prove the point with no doubt. Parents are discovering that today's education is getting mired in rewritten history and touchy/feely math where self-esteem is more important than the correct answer and the students are well regarded when they draw a good anti-smoking poster or write a politically correct anti-drug essay — as long as the child ties it all into the ozone and the rain forest.

WHEN/THEN

But, for those of us who have done some serious thinking about the future (and are not so self-indulgent as to think that our products will define the future), we are struck by the new programming construct that Bill has introduced: the

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WHEN/THEN statement. We all know about IF/THEN, but now we have a whole new concept called the WHEN/THEN statement and it has pervaded Bill's thinking. You can hardly read more than a page or two without running into...

```
WHEN [required technology glitch is solved] THEN
BEGIN
   wonderful_thing.1;
   wonderful_thing.2;
END ELSE
  WHEN
        .
        .
        .
  END; {it never seems to}
```

If anything, we technical people have learned in the last 20 years that non-linear stuff is dependent on initial conditions and early perturbations have a propensity to dramatically affect the results even a little ways down the road. I'm sure he knows this, and yet Bill compounds WHEN/THENs to an agonizing extent.

Bill does admit that it could be 5 or 10 years before the neopolitcal concept of an information superhighway gets to where we can actually download a movie or even a reasonable graphic image within the attention span of even the most hyped user. Let's be pessimistic and say it's 10 years. Can you believe how much will change in 10 years? That's nearly 15% of the average life expectancy today and is 2/3 of the l
the PC. I've got better things to do for what little t
have left of this planet and I think that when a few oth
up they won't sit around waiting for it either.

Real Opportunity

The opportunities abound to use technology to improve man's efficiency, productivity, and standard of living. I find good reason to be optimistic for technical people who search for ways to make life better rather than simply defining technically doable products that consumers must be convinced to buy and re-buy. Historically, technology has been typically embedded to have the greatest advantage.

I could write a book about how Bill has got education/knowledge/information all mis-wired — so I will. I guess maybe at this point I should announce my book ***The Mirage Ahead***, which is hereby copyrighted 1996 by William E. Gates. It will be out sometime later this year — and I do talk in the book about my 3,000 sq ft house that cost $7,000. I know Bill wasn't kidding in his book and neither am I.

Advance orders for ***The Mirage Ahead*** at $29 are now being taken. Don't bother to e-mail your opinion, just send a check.

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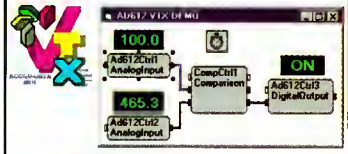

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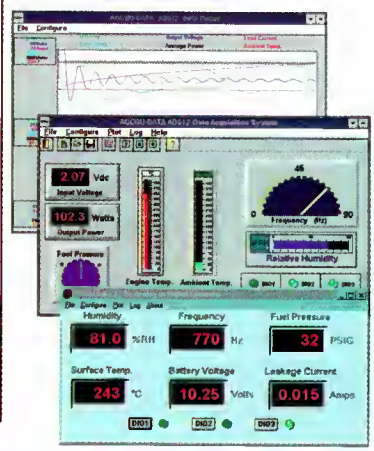

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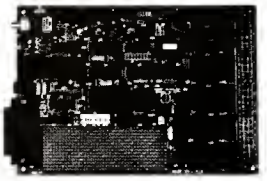

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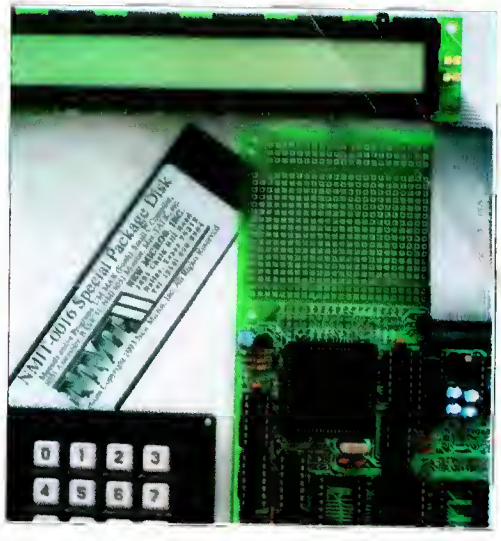
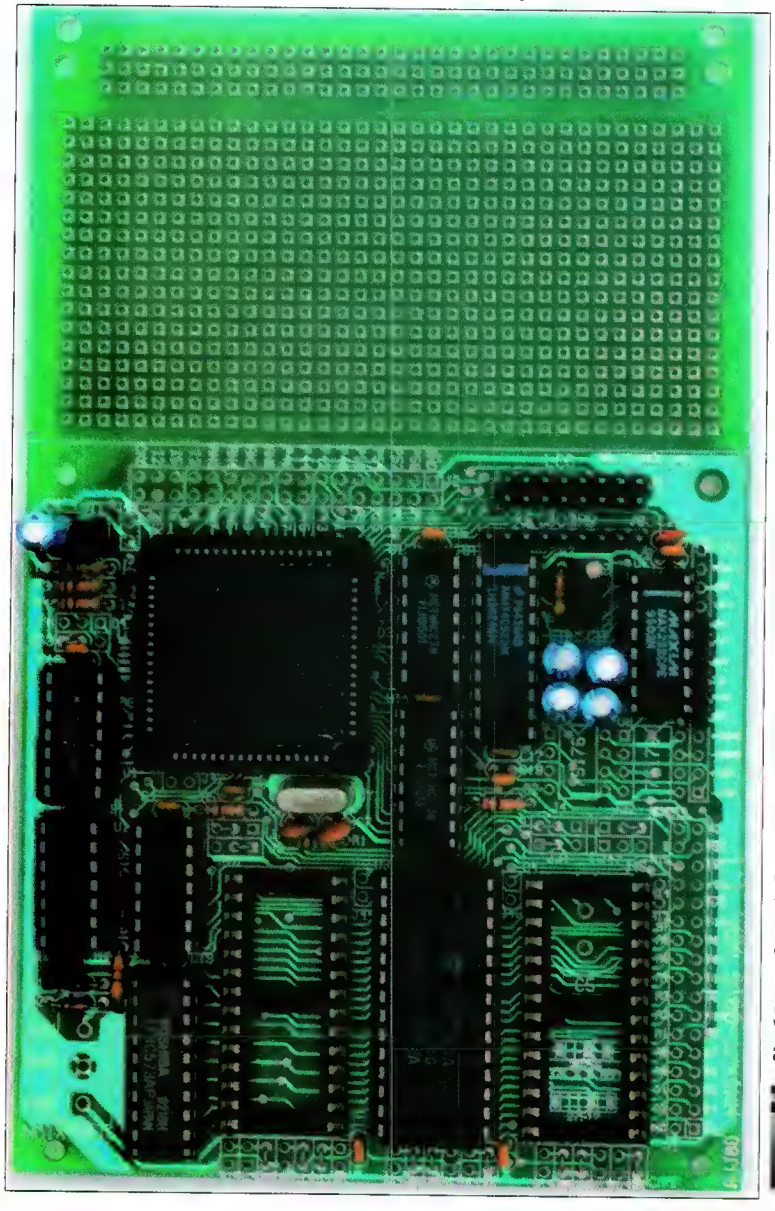


Low Cost Development Package: **Controller + Languages** + Manuals on disk included!



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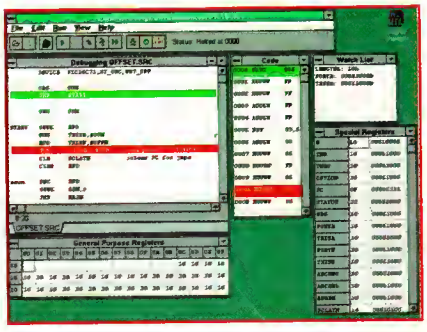

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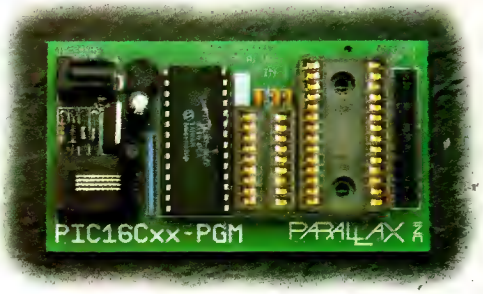

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